User's Manual

Model DY
Vortex Flowmeter
(Integral Type, Remote Type)
Model DYA
Vortex Flow Converter
(Remote Type)

digitalYEWFLO

IM 01R06A00-01E-E

vigilantplant.™

YOKOGAWA

IM 01R06A00-01E-E
3rd Edition, Jan. 2007

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INTRODUCTION

The DY series of vortex flowmeters have been fine-tuned to your order specifications prior to shipment. Before use, read this manual thoroughly and familiarize yourself fully with the features, operations and handling of digitalYEWFLO to have the instrument deliver its full capabilities and to ensure its efficient and correct use.

Notices Regarding This Manual

- This manual should be passed to the end user.
- The contents of this manual are subject to change without prior notice.
- All rights reserved. No part of this document may be reproduced or transmitted in any form or by any means without the written permission of Yokogawa Electric Corporation (hereinafter simply referred to as Yokogawa).
- This manual neither does warrant the marketability of this instrument nor it does warrant that the instrument will suit a particular purpose of the user.
- Every effort has been made to ensure accuracy in the contents of this manual. However, should any questions arise or errors come to your attention, please contact your nearest Yokogawa sales office that appears on the back of this manual or the sales representative from which you purchased the product.
- This manual is not intended for models with custom specifications.
- Revisions may not always be made in this manual in conjunction with changes in specifications, constructions and/or components if such changes are not deemed to interfere with the instrument's functionality or performance.

Notices Regarding Safety and Modification

- For the protection and safety of personnel, the instrument and the system comprising the instrument, be sure to follow the instructions on safety described in this manual when handling the product. If you handle the instrument in a manner contrary to these instructions, Yokogawa does not guarantee safety.
- If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.
- As for explosionproof model, if you yourself repair or modify the instrument and then fail to return it to its original form, the explosion-protected construction of the instrument will be impaired, creating a hazardous condition. Be sure to consult Yokogawa for repairs and modifications.

Safety and Modification Precautions

- The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Yokogawa assumes no liability for the customer's failure to comply with these requirements. If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.
- The following safety symbol marks are used in this user's manual and instrument.

WARNING

A WARNING sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death of personnel.

CAUTION

A CAUTION sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

IMPORTANT

An IMPORTANT sign denotes that attention is required to avoid damage to the instrument or system failure.

NOTE

A NOTE sign denotes information necessary for essential understanding of operation and features.

⏚ Functional grounding terminal

⎓ Direct current

Warranty

- The warranty of this instrument shall cover the period noted on the quotation presented to the Purchaser at the time of purchase. The Seller shall repair the instrument free of charge when the failure occurred during the warranty period.
- All inquiries on instrument failure should be directed to the Seller's sales representative from whom you purchased the instrument or your nearest sales office of the Seller.
- Should the instrument fail, contact the Seller specifying the model and instrument number of the product in question. Be specific in describing details on the failure and the process in which the failure occurred. It will be helpful if schematic diagrams and/or records of data are attached to the failed instrument.
- Whether or not the failed instrument should be repaired free of charge shall be left solely to the discretion of the Seller as a result of an inspection by the Seller.

The Purchaser shall not be entitled to receive repair services from the Seller free of charge, even during the warranty period, if the malfunction or damage is due to:

- improper and/or inadequate maintenance of the instrument in question by the Purchaser.
- handling, use or storage of the instrument in question beyond the design and/or specifications requirements.
- use of the instrument in question in a location not conforming to the conditions specified in the Seller's General Specification or Instruction Manual.
- retrofitting and/or repair by an other party than the Seller or a party to whom the Seller has entrusted repair services.
- improper relocation of the instrument in question after delivery.
- reason of force measure such as fires, earthquakes, storms/floods, thunder/lightning, or other reasons not attributable to the instrument in question.

Using the Vortex Flowmeter Safely

WARNING

(1) Installation
- Installation of the vortex flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to installation.
- The vortex flowmeter is a heavy instrument. Be careful that no damage is caused to personnel through accidentally dropping it, or by exerting excessive force on the vortex flowmeter. When moving the vortex flowmeter, always use a trolley and have at least two people carry it.
- When the vortex flowmeter is processing hot fluids, the instrument itself may become extremely hot. Take sufficient care not to get burnt.
- Where the fluid being processed is a toxic substance, avoid contact with the fluid and avoid inhaling any residual gas, even after the instrument has been taken off the line for maintenance and so forth.
- All procedures relating to installation must comply with the electrical code of the country where it is used.

(2) Wiring
- The wiring of the vortex flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.
- When connecting the wiring, check that the supply voltage is within the range of the voltage specified for this instrument before connecting the power cable. In addition, check that no voltage is applied to the power cable before connecting the wiring.
- The functional grounding must be connected securely at the terminal with the ⏚ mark to avoid danger to personnel.

(3) Operation
- Only expert engineer or skilled personnel are permitted to open the cover.

(4) Maintenance
- Maintenance on the vortex flowmeter should be performed by expert engineer or skilled personnel. No operator shall be permitted to perform any operations relating to maintenance.
- Always conform to maintenance procedures outlined in this manual. If necessary, contact Yokogawa.
- Care should be taken to prevent the build up of dirt, dust or other substances on the display panel glass or data plate. If these surfaces do get dirty, wipe them clean with a soft dry cloth.

(5) Explosion Protected Type Instrument
- For explosion proof type instrument, the description in Chapter 10 “EXPLOSION PROTECTED TYPE INSTRUMENT” is prior to the other description in this user's manual.
- Only trained persons use this instrument in the industrial location.
- The functional grounding ⏚ must be connected to a suitable IS grounding system.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

(6) European Pressure Equipment Directive (PED)
- When using the instrument as a PED-compliant product, be sure to read Chapter 11 before use.

ATEX Documentation

This procedure is only applicable to the countries in European Union.

GB

All instruction manuals for ATEX Ex related products are available in English, German and French. Should you require Ex related instructions in your local language, you are to contact your nearest Yokogawa office or representative.

DK

Alle brugervejledninger for produkter relateret til ATEX Ex er tilgængelige på engelsk, tysk og fransk. Skulle De ønske yderligere oplysninger om håndtering af Ex produkter på eget sprog, kan De rette henvendelse herom til den nærmeste Yokogawa afdeling eller forhandler.

I

Tutti i manuali operativi di prodotti ATEX contrassegnati con Ex sono disponibili in inglese, tedesco e francese. Se si desidera ricevere i manuali operativi di prodotti Ex in lingua locale, mettersi in contatto con l'ufficio Yokogawa più vicino o con un rappresentante.

E

Todos los manuales de instrucciones para los productos antiexplosivos de ATEX están disponibles en inglés, alemán y francés. Si desea solicitar las instrucciones de estos artículos antiexplosivos en su idioma local, deberá ponerse en contacto con la oficina o el representante de Yokogawa más cercano.

NL

Alle handleidingen voor producten die te maken hebben met ATEX explosiebeveiliging (Ex) zijn verkrijgbaar in het Engels, Duits en Frans. Neem, indien u aanwijzingen op het gebied van explosiebeveiliging nodig hebt in uw eigen taal, contact op met de dichtstbijzijnde vestiging van Yokogawa of met een vertegenwoordiger.

SF

Kaikkien ATEX Ex -tyyppisten tuotteiden käyttöhjeet ovat saatavilla englannin-, saksan- ja ranskankielisinä. Mikäli tarvitsette Ex -tyyppisten tuotteiden ohjeita omalla paikallisella kielellännne, ottakaa yhteyttä lähimpään Yokogawa-toimistoon tai -edustajaan.

P

Todos os manuais de instruções referentes aos produtos Ex da ATEX estão disponíveis em Inglês, Alemão e Francês. Se necessitar de instruções na sua língua relacionadas com produtos Ex, deverá entrar em contacto com a delegação mais próxima ou com um representante da Yokogawa.

F

Tous les manuels d'instruction des produits ATEX Ex sont disponibles en langue anglaise, allemande et française. Si vous nécessitez des instructions relatives aux produits Ex dans votre langue, veuillez bien contacter votre représentant Yokogawa le plus proche.

D

Alle Betriebsanleitungen für ATEX Ex bezogene Produkte stehen in den Sprachen Englisch, Deutsch und Französisch zur Verfügung. Sollten Sie die Betriebsanleitungen für Ex-Produkte in Ihrer Landessprache benötigen, setzen Sie sich bitte mit Ihrem örtlichen Yokogawa-Vertreter in Verbindung.

S

Alla instruktionsböcker för ATEX Ex (explosionssäkra) produkter är tillgängliga på engelska, tyska och franska. Om Ni behöver instruktioner för dessa explosionssäkra produkter på annat språk, skall Ni kontakta närmaste Yokogawakontor eller representant.

GR

Ολα τα εγχειριδια λειτουργιαζ των προιουτ϶υ με ATEX Ex διατιθευται στα Αγγλικα, Γερμαυικα και Γαλλικα. Σε περιπτωση που χρειαζεοτε οδηγιεζ σχετικα με Ex στηυ τοπικη γλωσσα παρακαλουμε επικοιυωυηστε με το πλησιεστερο γραφειο τηζ Yokogawa η αντιπροσωπο τηζ.

SK

Všetky návody na obsluhu pre prístroje s ATEX Ex sú k dispozícii v jazyku anglickom, nemeckom a francúzskom. V prípade potreby návodu pre Ex-prístroje vo Vašom národnom jazyku, skontaktujte prosím miestnu kanceláriu firmy Yokogawa.

CZ

Všechny uživatelské příručky pro výrobky, na něž se vztahuje nevýbušné schválení ATEX Ex, jsou dostupné v angličtině, němčině a francouzštině. Požadujete-li pokyny týkající se výrobků s nevýbušným schválením ve vašem lokálním jazyku, kontaktujte prosím vaši nejbližší reprezentační kancelář Yokogawa.

LT

Visos gaminiø ATEX Ex kategorijos Eksploatavimo instrukcijos teikiami anglø, vokieèiø ir prancûzø kalbomis. Norëdami gauti prietaisø Ex dokumentacijà kitomis kalbomis susisiekite su artimiausiu bendrovës “Yokogawa” biuru arba atstovu.

LV

Visas ATEX Ex kategorijas izstrâdâjumu Lietoðanas instrukcijas tiek piegâdâtas angïu, vâcu un franèu valodâs. Ja vçlaties saòemt Ex ierîèu dokumentâciju citâ valodâ, Jums ir jâsazinâs ar firmas Jokogava (Yokogawa) tuvâko ofisu vai pârstâvi.

EST

Kõik ATEX Ex toodete kasutamisjuhendid on esitatud inglise, saksa ja prantsuse keeles. Ex seadmete muukeelse dokumentatsiooni saamiseks pöörduge lähima Iokagava (Yokogawa) kontori või esindaja poole.

PL

Wszystkie instrukcje obsługi dla urządzeń w wykonaniu przeciwwybuchowym Ex, zgodnych z wymaganiami ATEX, dostępne są w języku angielskim, niemieckim i francuskim. Jeżeli wymagana jest instrukcja obsługi w Państwa lokalnym ję zyku, prosimy o kontakt z najbliższym biurem Yokogawy.

SLO

Vsi predpisi in navodila za ATEX Ex sorodni pridelki so pri roki v anglišèini, nemšèini ter francošèini. Èe so Ex sorodna navodila potrebna v vašem tukejnjem jeziku, kontaktirajte vaš najbliši Yokogawa office ili predstaunika.

H

Az ATEX Ex mûszerek gépkönyveit angol, német és francia nyelven adjuk ki. Amennyiben helyi nyelven kérik az Ex eszközök leírásait, kérjük keressék fel a legközelebbi Yokogawa irodát, vagy képviseletet.

BG

Всички упътвания за продукти от серията ATEX Ex се предлагат на английски, немски и френски език. Ако се нуждаете от упътвания за продукти от серията Ex на родния ви език, се свържете с най-близкия офис или представителство на фирма Yokogawa.

RO

Toate manualele de instructiuni pentru produsele ATEX Ex sunt in limba engleza, germana si franceza. In cazul in care doriti instructiunile in limba locala, trebuie sa contactati cel mai apropiat birou sau reprezentant Yokogawa.

M

Il-manwali kollha ta’ l-istruzzjonijiet għal prodotti marbuta ma’ ATEX Ex huma disponibbli bl-Ingliż, bil-Ġermaniż u bil-Franċiż. Jekk tkun teħtieġ struzzjonijiet marbuta ma’ Ex fil-lingwa lokali tiegħek, għandek tikkuntattja lill-eqreb rappreżentan jew uffiċċju ta’ Yokogawa.

1. HANDLING PRECAUTIONS

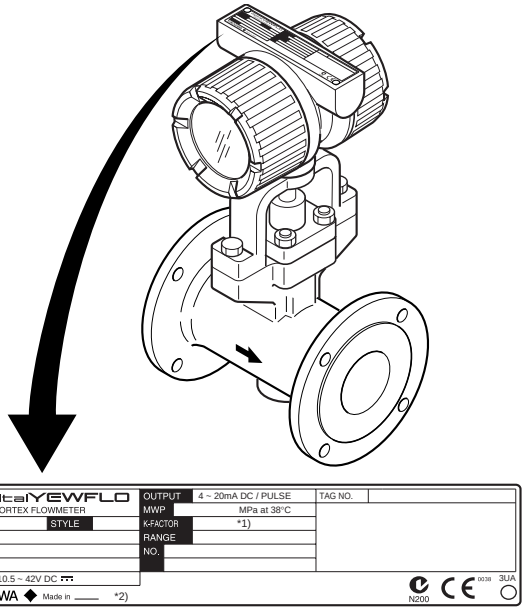
The Model DY Vortex Flowmeter and Model DYA Vortex Flow Converter are thoroughly tested at the factory before shipment. When these instruments are delivered, perform a visual check to ascertain that no damage occurred during shipment.

This section describes important cautions in handling these instruments. Read carefully before using them.

If you have any problems or questions, contact your nearest YOKOGAWA service center or sales representative.

1.1 Model and Specifications

The model and important specifications are indicated on the data plate attached to the case. Verify that they are the same as those specified in the original order, referring to paragraph 9.2 to 9.5. In any correspondence, always give model (MODEL), serial number (NO) and calibrated range (RANGE) from the data plate.



*1): K factor at 15°C
*2): The product - producing country.

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Figure 1.1(a) Example of Data Plate for Integral Type

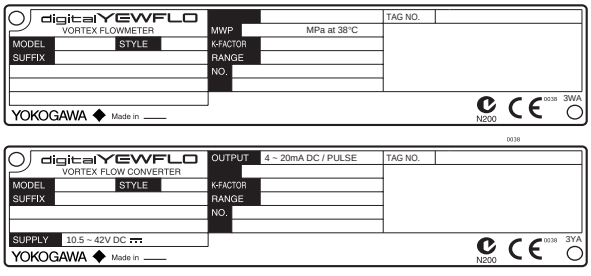

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Figure 1.1(b) Example of Data Plate for Remote Type

1.2 Precautions Regarding Transportation and Storage Location

To protect against accidental damage to digitalYEWFLO while transporting it to a new location, pack it in the original packing as when shipped from the Yokogawa factory.

WARNING

The Vortex Flowmeter is a heavy instrument. Please be careful to prevent persons from injuring when it is handled.

Deterioration in insulation or corrosion can occur for unexpected reasons if digitalYEWFLO is left uninstalled for a prolonged period after delivery. If digitalYEWFLO is likely to be stored over a prolonged period, observe the following precautions.

- Store the vortex flowmeter with forwarded statement.
- Choose a storage location that satisfies the following requirements:
  - Not exposed to rain or splashwater.
  - Less susceptible to mechanical vibration or shock.
  - Kept within the temperature and humidity ranges shown in the following table, preferably at normal temperature and humidity (approximately 25°C, 65%)

Temperature	–40°C to +80°C
Humidity	5 to 100% (no condensation)

T010201.EPS

1.3 Precautions Regarding Installation Locations

(1) Ambient Temperature

Avoid an area which has wide temperature variations. When the installation area is subjected to heat radiation from process plant, ensure adequate heat prevention or ventilation.

(2) Atmospheric Conditions

Avoid installing the vortex flowmeter in a corrosive atmosphere. When the vortex flowmeter must be installed in a corrosive atmosphere, adequate ventilation must be provided.

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(3) Mechanical Shock or Vibration

The vortex flowmeter is of sturdy construction, but select an area subject to minimize mechanical vibrations or impact shock. If the flowmeter is subject to vibrations, it is recommended that pipeline supports to be provided as shown in Figure 1.2.

(4) Other Considerations

- Choose a location where is sufficient clearance around digitalYEWFLO exist to allow such work as routine inspections.
- Choose a location that ensures easy wiring and piping.

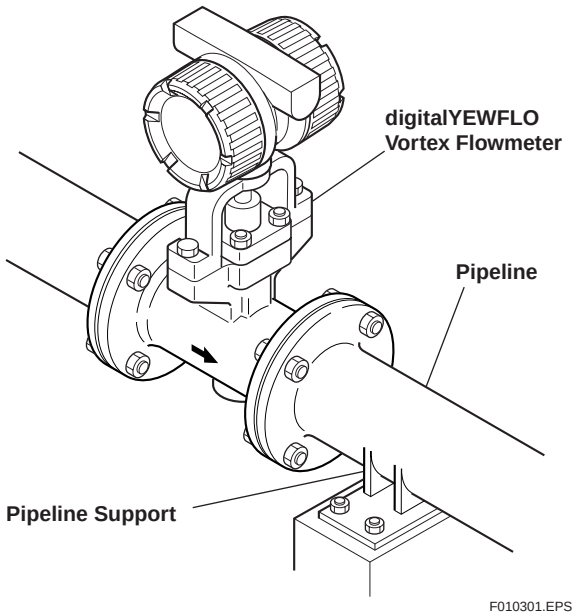


Figure 1.2

2. INSTALLATION

WARNING

This instrument must be installed by expert engineer or skilled personnel. The procedures described in this chapter are not permitted for operators.

2.1 Precautions Regarding Installation Locations

(1) Ambient Temperature

Avoid an area which has wide temperature variations. When the installation area is subjected to heat radiation from process plant, ensure adequate heat prevention or ventilation.

(2) Atmospheric Conditions

Avoid installing the vortex flowmeter in a corrosive atmosphere. When the vortex flowmeter must be installed in a corrosive atmosphere, adequate ventilation must be provided

(3) Mechanical Shock or Vibration

The vortex flowmeter is of sturdy construction, but select an area subject to minimize mechanical vibration or impact shock. If the flowmeter is subject to vibrations, it is recommended that pipeline supports to be provided as shown in Figure 2.1.

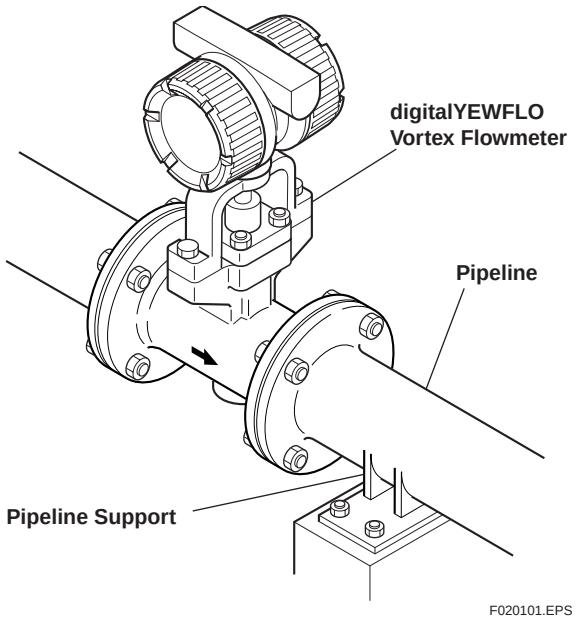


Figure 2.1

(4) Precautions Regarding Piping

(a) Ensure that the process connector bolts are tightened firmly.
(b) Ensure that no leak exists in the process connection pipeline.
(c) Do not apply a pressure higher than the specified maximum working pressure.
(d) Do not loosen or tighten the flange mounting bolts when the assembly is pressurized.
(e) Handle the vortex flowmeter carefully when measuring dangerous liquids, so that the liquids do not splash into eyes or on face. When using dangerous gases, be careful not to inhale them.

2.2 Piping

See Table 2.1 about Valve Position and Straight Pipe Length and so on.

Piping support

Typical vibration immunity level is 1G for normal piping condition.Piping support should be fixed in case of over 1G vibration level.

Installation direction

If a pipe is always filled with liquids, the pipe can be installed vertically or at inclined angle.

Adjacent pipes

The process pipline inner diameter should be larger than the digitalYEWFLO inner diameter.
Use the following adjacent pipe:

Sch 40 or less:
Model Code DY015 up to DY050
DY025-/R1 up to DY080-/R1
DY040-/R2 up to DY100-/R2

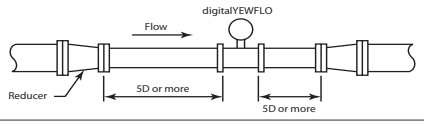
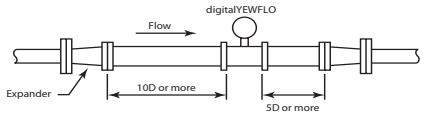
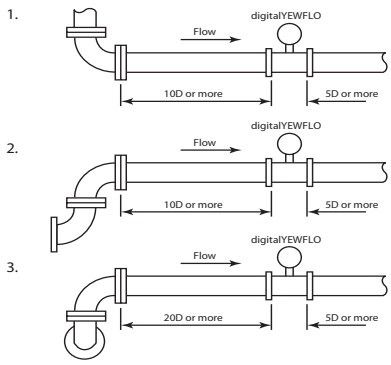
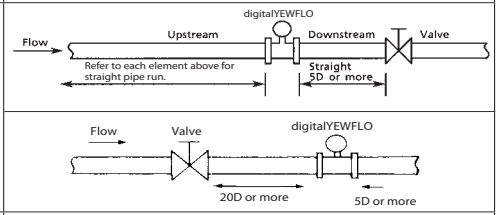
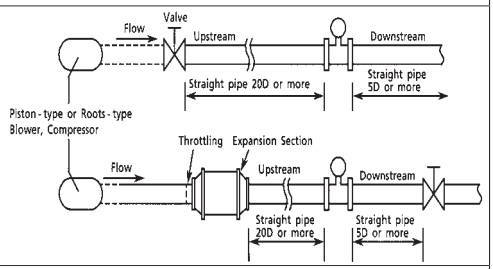
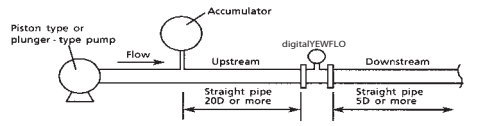
Sch 80 or less:
Model Code DY080 up to DY300
DY100-/R1 up to DY200-/R1
DY150-/R2 up to DY200-/R2

Straight pipe length

*D: piping diameter

*K-factor may be influenced about 0.5% in case that straight pipe length of upstream is less than values below.

Table 2.1 Installation

Description	Figure
Reducer pipe: Ensure the upstream straight pipe length to be 5D or more, and the downstream straight pipe length to be 5D or more for per reducer pipe.	
Expander pipe: Ensure the upstream straight pipe length to be 10D or more, and the downstream straight pipe length to be 5D or more for per expander pipe.	
Bent pipe and straight pipe length: 1. Single bent pipe 2. Double bent pipe; coplanar 3. Double bent pipe; non coplanar	
Valve position and straight pipe length: ■ Install the valve on the downstream side of the flowmeter. The upstream straight pipe length dependent on the element located on the upstream such as reducer/expander, bent and etc., refer to description as above. Keep 5D or more for downstream straight pipe length. ■ In case the valve has to be installed on the upstream of the flowmeter, ensure the upstream straight pipe length to be 20D or more, and the downstream straight pipe length be 5D or more.	
Fluid vibration: For a gas line which uses a position-type or roots-type blower compressor or a high-pressure liquid line (about 1MPa or more) which uses piston-type or plunger-type pump, fluid vibrations may be produced. In these case, install valve on the upstream side of digitalYEWFLO. For inevitable fluid vibration, put a vibration damping device such as throttling plate or expansion section in the upstream side of digitalYEWFLO.	
Piston-type or plunger pump: Install the accumulator on the upstream side of digitalYEWFLO to reduce fluid vibrations.	

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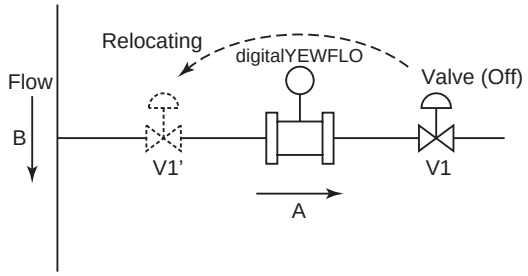
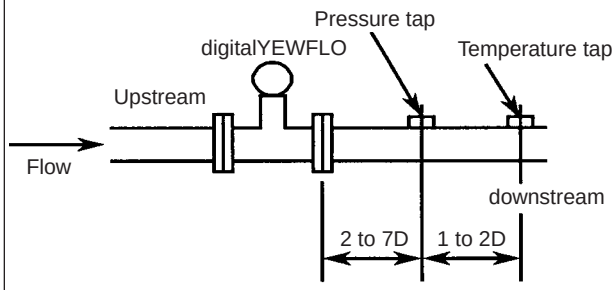
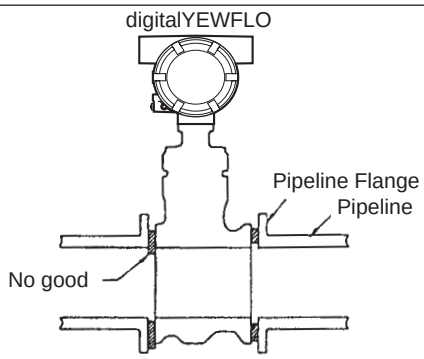
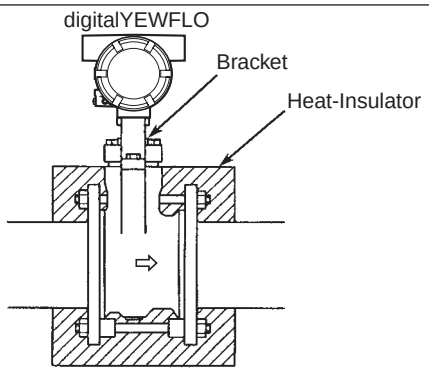
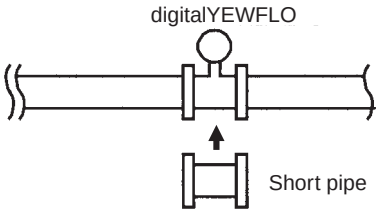
Description	Figure
Valve positon (T-type piping exist): When pulsation causes by a T-type piping exist, install the valve on the upstream of the flowmeter. Example:As shown in the figure, when the valve V1 is turned off, the fluid flow throught B as to meter A the flow is zero. But due to the pulsating pressure is detected, the meter is zero point become fluctuating. To avoid this, change the valve V1 location to V1'. • In case of the Reduced Bore type, moisture may be remained upstream of the flowmeter. Drain it appropriately.	
Pressure and Temperature Taps: Pressure tap outlet: install this tap between 2D and 7D on the downstream side of a flowmeter. Temperature tap outlet: install this on the downstream side 1D to 2D away from a pressure tap.	
Mounting Gasket: Avoid mounting gaskets which protrude into the pipe line. This may cause inaccurate readings. Use the gaskets with bolt holes, even if digitalYEWFLO is the wafer type. When using a spiral gasket(without bolt holes), confirm the size with the gasket -manufacturer, as standard items may not be used for certain flange ratings.	
Heat-Insulation: When an integral-type flowmeter or a remote type detector is installed and the pipe carrying higt-temperature fluids is heat-insulated, do not wrap adiabatic materials around the installation bracket of the converter. • Refer to “2.5 Cryogenic and High Process Temperature Version Insulation” and install it rightly.	
Flushing of the pipe line: Flush and clean scale, incrustation and sludge on the inside of pipe for newly installed pipe line and repaired pipe line before the operation. For flushing, the flow should flow through bypass-piping to avoid damaging the flowmeter. If there is no bypass-piping, install short pipe instead of the flowmeter.	

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2.3 Precautions Regarding Installation

WARNING

In case of high process temperature, care should be taken not to burn yourself because the surface of body and case reach a high temperature.

(1) Gas or Steam Measuring Precautions

- **Piping to Prevent Standing Liquid**
  Mount digitalYEWFLO in a vertical pipeline to avoid liquid traps. When digitalYEWFLO is installed horizontally, raise that part of the pipeline in which the digitalYEWFLO is installed.

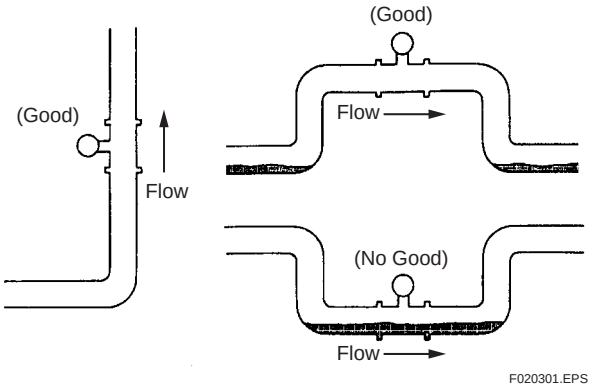


Figure 2.2

(2) Liquid Measurement Precautions

To insure accurate measurement, the digitalYEWFLO must always have a full pipe.

- **Piping Requirements for Proper Operation**
  Allow the flow to flow against gravity. When the flow is moving with gravity, lift the down-stream pipe length above the digitalYEWFLO installation level to maintain full pipeline.

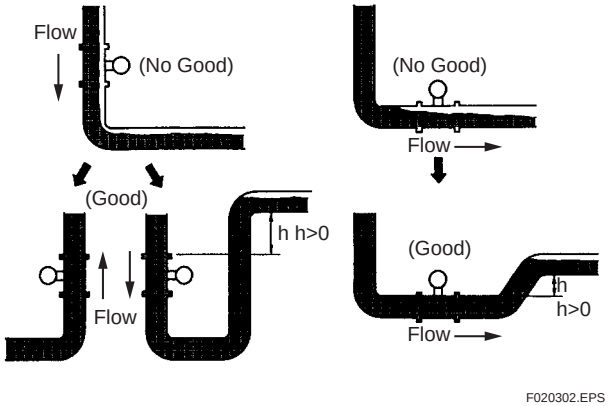


Figure 2.3

- **Piping for Avoiding Bubbles**
  Flows containing both gas and liquid cause problems. Avoid gas bubbles in a liquid flow. Piping should be carried out to avoid bubble generation.
  Install the valve on the downstream side of the flowmeter because pressure drop across the control valve may cause gas to come out of the solution.

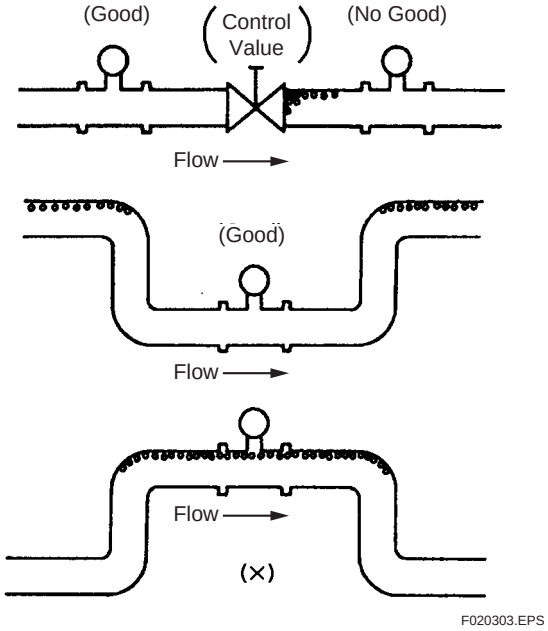


Figure 2.4

(3) Multi-Phase Flow

digitalYEWFLO can measure gas, liquid and steam when there is no change in state. However, accurate measurement of mixed flows (e.g. gas and liquid) is not possible.

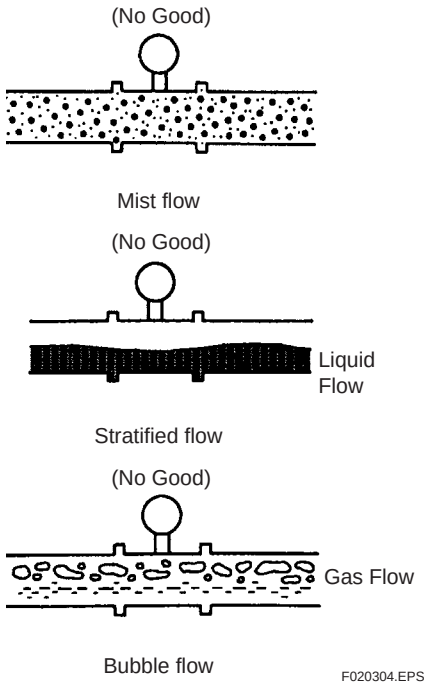


Figure 2.5

(4) Pipeline Diameter and digitalYEWFLO

The process pipeline inner diameter should be slightly larger than the vortex flowmeter inner diameter, schedule 40 or lower pipe should be used for 1/2 to 2 inch flowmeters and schedule 80 or lower pipes for 3 to 8 inch flowmeters.

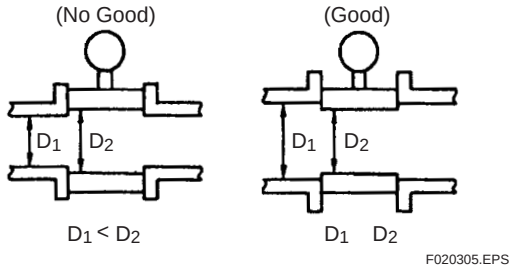


Figure 2.6

(5) Waterproof Construction

The vortex flowmeter is of IP67, NEMA4X tight protection. However, it cannot be used under water.

2.4 Piping to Improve Durability

(1) Pipe cleaning

- Flushing of pipe line (Cleaning)
  Flush and clean scale, incrustation and sludge on the inside of pipe wall for newly installed pipe line and repaired pipe line before the operation.
- Fluid Carrying Solids
  Do not measure fluids that carry solids (e.g. sand and pebbles). Make sure users periodically remove solids adhering to the vortex shedder.
- Obstruction of flow fluids may cause to make a chemical reaction and the fluid will be crystallized and hardened, and be deposited on the pipe wall and shedder bar.
  In those cases, clean shedder bar.

(2) Bypass piping

Installing a bypass, as illustrated in the figure below, permits the digitalYEWFLO to be checked or cleaned conveniently (vortex shedder, etc.).

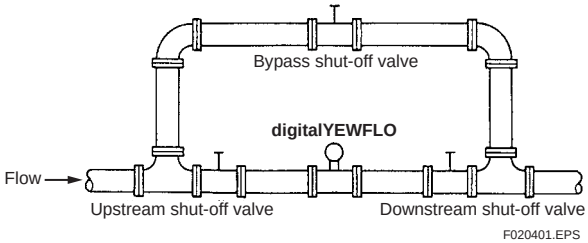


Figure 2.7

2.5 Cryogenic and High process Temperature Version Insulation

When you are using cryogenic type and high process temperature version of digitalYEWFLO Vortex Flowmeter (Option code/HT /LT), refer to illustrated insulation method as shown in Figure 2.8

(1) Installing Cryogenic Vortex Flowmeter

For cryogenic applications, use stainless steel mounting bolts and nuts to install the flowmeter. These can be ordered separately from YOKOGAWA. Cover the flowmeter body with heat insulating material so that the flowmeter can be maintained at ultra-low temperatures (refer to the Figure 2.8).

(2) Maintenance for Cryogenic Applications

DY/LT uses special materials that produce vortex flowmeter for cryogenic applications. When you are replacing a shedder bar, specify cryogenic type shedder bar. To avoid condensing in the terminal box, ensure that the wire connecting port is well sealed.

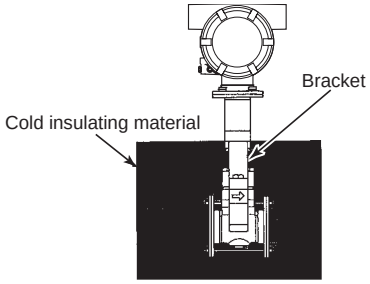


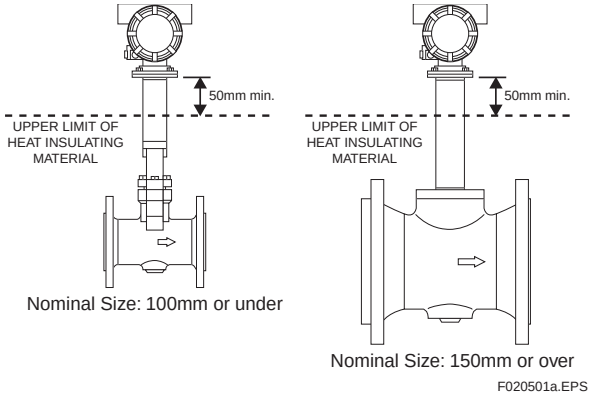
Figure 2.8

(3) Installing High Process Temperature Vortex Flowmeter

Installation of the flowmeter is the same as the standard type. Cover the flowmeter body with heat insulating material following instruction of “CAUTION”.

⚠ CAUTION

Keep the upper limit of heat insulating material to prevent overheating of the terminal box.
Seal the heat insulating material to avoid hot-air leakage.



(4) Maintenance for High Process Temperature Applications

DY/HT uses special materials that produce vortex flowmeter for High Process Temperature applications When you are replacing a shedder bar or a gasket, specify High Process Temperature type.

2.6 Installing the Vortex Flowmeter

WARNING

The Vortex Flowmeter is a heavy instrument. Please be careful to prevent persons from injuring whin it is handled.

Before installing the instrument verify the following. The direction of flow should match to the arrow mark on the instrument body. When changing the orientation of the terminal box, refer to "7.1."

Installation of Vortex flowmeter of the wafer and flange type is shown in Table 2.3.

When installing the wafer type vortex flowmeter, it is important to align the instrument bore with the inner diameter of the adjacent piping.

To establish alignment, use the four collars supplied with the instrument.

1. Four collars are supplied for 1/2 inch (15mm) to 1- 1/ 2inch (40mm), 2 inch of JIS 10K or ANSI class 150 or JPI class 150, and 3 inch of ANSI class 150 or JPI class 150. Install the instrument as illustrated in Table 2.2.
2. If the adjacent flanges have eight bolt holes, insert the stud bolts in the holes on the instrument shoulder. Refer to Figure 2.9.
   Stainless steel stud bolts and nuts are available on order. When they are to be supplied by the user, refer to Table 2.2 for stud bolt length. Gaskets must be supplied by the user.
3. Gasket:
   Avoid mounting gaskets which protrude into the pipeline. This may cause inaccurate readings.
   Use gaskets with bolt holes, even if digitalYEWFLO is of the wafer type. Refer to Figure 2.10.
   When using a spiral gasket (without bolt holes), confirm the size with the gasket-manufacturer, as standard items may not be used for certain flange ratings.

Table 2.2

Size mm (inch)	Flange Rating	Major Diameter of External Threed of Stud Bolt d (mm)	Length ℝ(mm)
15mm (1/2B)	JIS 10K, 20K/DIN 10, 16,25,40	12	160
	JIS 40K	16	160
	ANSI 150, 300, 600	12.7	155
25mm (1B)	JIS 10K, 20K, 40K	16	160
	ANSI 150	12.7	155
	ANSI 300, 600	15.9	160
	DIN 10, 16, 25, 40	12	160
40mm (1-1/2B)	JIS 10K, 20K/DIN 10, 16, 25, 40	16	160
	JIS 40K	20	170
	ANSI 150	12.7	155
	ANSI 300, 600	19.1	170
50mm (2B)	JIS 10K, 20K, 40K/ DIN 10, 16, 25, 40	16	200
	ANSI 150, 300, 600	15.9	
80mm (3B)	JIS 10K/DIN 10, 16, 25, 40	16	220
	JIS 20K, 40K	20	240
	ANSI 150	15.9	
	ANSI 300, 600	19.1	
100mm (4B)	JIS 10K/DIN 10, 16	16	220
	JIS 20K/DIN 25, 40	20	240
	JIS 40K	22	270
	ANSI 150	15.9	240
	ANSI 300	19.1	240
	ANSI 600	22.2	270

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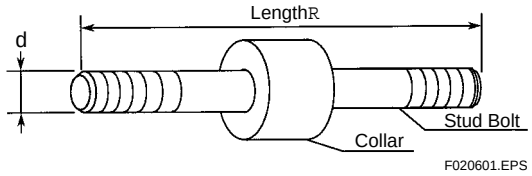


Figure 2.9

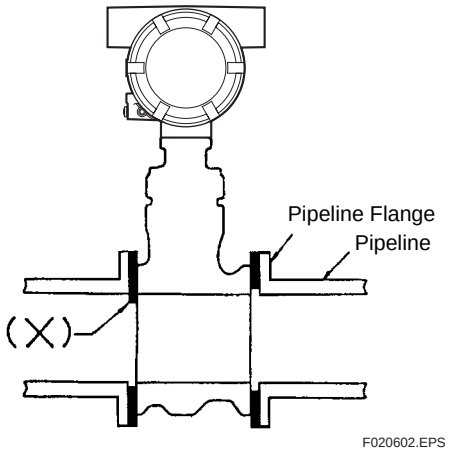


Figure 2.10

Table 2.3(a) Installation of Wafer Type Vortex Flowmeter

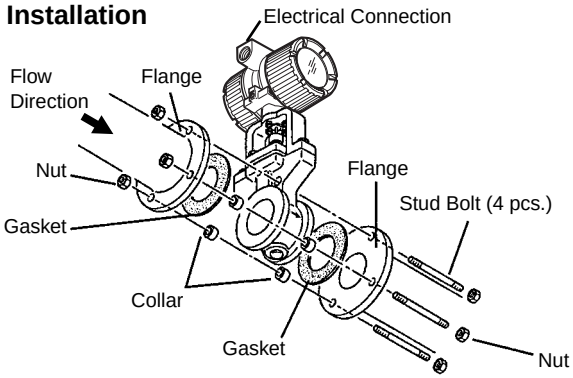
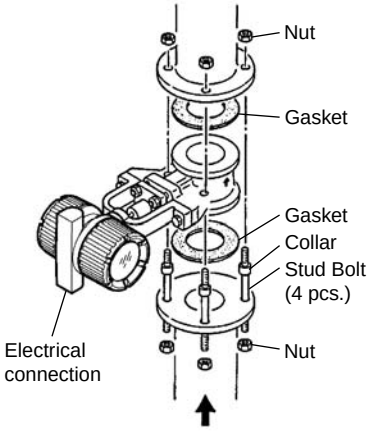
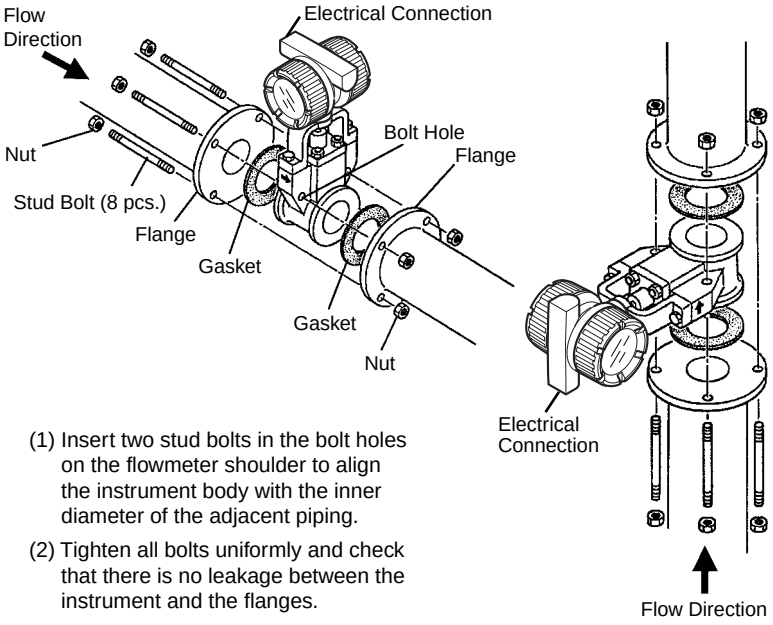
Wafer type	Description
When Installation Collar are required, the installation vortex flowmeters applied to the following line sizes and flange ratings. **Size mm(inch) / Flange Rating** 15 to 40 (1/2 to 1-1/2) — All ratings 50(2) — JIS 10K, ANSI class 150, DIN PN10 to PN40 80(3) — ANSI class 150, JPI class 150	**Horizontal Installation**  (1) Insert four collar on each of the four bolts and check that all four collars contact the outside diameter of the flowmeter body. (2) Tighten the four bolts uniformly. Check for leakage from the flange connections.
⚠ WARNING The inside diameter of the gasket must be larger than the pipe inner diameter so that it will not disturb the flow in the pipeline. **⚠ WARNING** When installing the Flowmeter vertically in the open air, change the electrical connection port direction to the ground. If the electrical connection port is installed upwards, rain water might leak in.	**Vertical Installation**  (1) Insert two each collars on each of the lower two bolts. (2) Place the flowmeter body on the lower two bolts. (3) Tighten the four bolts (including upper two bolts) and nuts uniformly. (4) Check for leakage from the flange connections.
When Installation Collars are not required,the installation vortex flowmeters applied to the following line sizes and flanges. **Size mm(inch) / Flange Rating** 50(2) — JIS 20K, 40K; ANSI class 300,600; JPI class 300,600 80(3) — JIS 10K, 20K, 40K; ANSI class 300, 600; JPI class 300,600 100(4) — JIS 10K, 20, 40K; ANSI class 150, 300, 600; JPI class 150,300,600	**Horizontal Installation** **Vertical Installation**  (1) Insert two stud bolts in the bolt holes on the flowmeter shoulder to align the instrument body with the inner diameter of the adjacent piping. (2) Tighten all bolts uniformly and check that there is no leakage between the instrument and the flanges.

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Table 2.3(b) Installation of Flange Type Vortex Flowmeter

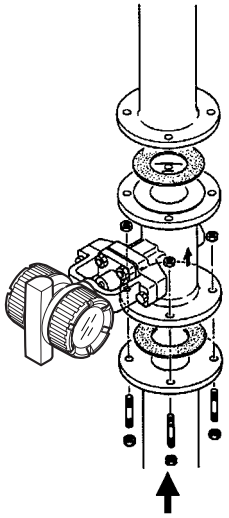
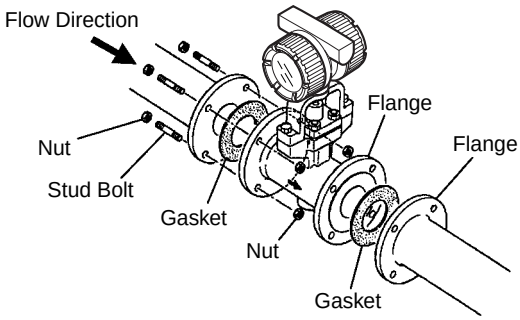
Flange type	Description
Use the stud bolts and nuts supplied with the flowmeter of the user. The gaskets should be supplied by the user. ⚠ **CAUTION** The inside diameter of the gasket must be larger than the pipe inner diameter so that it will not disturb the flow in the pipeline.	 Flow Direction **Vertical Installation** **Horizontal Installation** 

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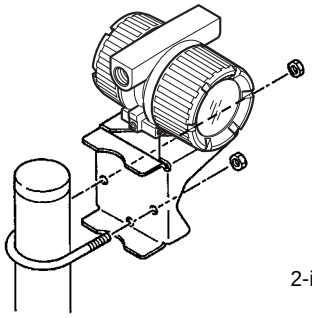
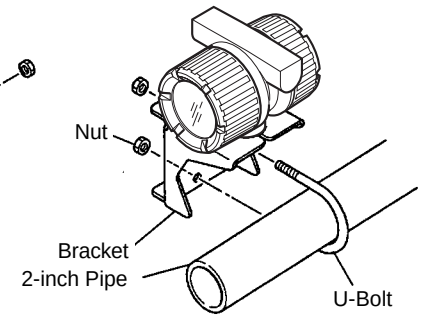
Table 2.3(c) Installation of remote Type Converter

Remote type converter	Description
⚠ **CAUTION** A signal cable (DYC) is used between the remote type flowmeter and the converter. The maximum signal cable length is 97.5ft (30m).	The converter is mounted on a 2-inch (60.5mm outer dia.) stanchion or horizontal pipe. Do not mount the converter on a vertical pipe. It makes wiring and maintenance difficult. The converter mounting orientation can be changed as illustrated below. **Stanchion Mounting**  **Horizontal Pipe Mounting** 

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3. WIRING

WARNING

The wiring of the vortex flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.

CAUTION

Once all wiring is complete, check the connections before applying power to the instrument. Improper arrangements or wiring may cause a unit malfunction or damage.

3.1 Wiring Precautions

Be sure to observe the following precautions when wiring:

CAUTION

- In cases where the ambient temperature exceeds 50°C (122°F), use external heat-resistant wiring with a maximum allowable temperature of 70°C (158°F) or above.
- Do not connect cables outdoors in wet weather in order to prevent damage from condensation and to protect the insulation.
- Do not splice the cable between the flowtube terminal and the converter if it is too short. Replace the short cable with a cable that is the appropriate length.
- All the cable ends must be provided with round crimp-on terminals and be securely wired.
- Be sure to turn power off before opening the cover.
- Before turning the power on, tighten the cover securely.
- Explosion protected types must be wired in accordance with specific requirement (and, in certain countries, legal regulations) in order to preserve the effectiveness of their explosion protected features.
- The terminal box cover is locked by the clamp. In case of opening the terminal box cover, use the hexagonal wrench attached.
- Be sure to lock the cover by the clamp using the hexagonal wrench attached after installing the cover.

3.2 Wiring for Output Condition

Table 3.1 shows the connection method of several output conditions.

(1) Analog Output (4 to 20 mA DC)

This converter uses the same two wires for both, the signal and power supply. A DC power supply is required in a transmission loop. The total leadwire resistance including the instrument load and power distributor (supplied by the user) must conform to a value in the permissible load resistance range. Refer to Figure 3.1 shows.

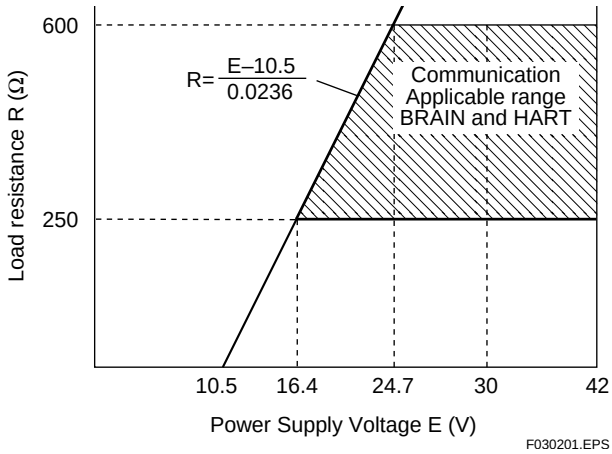


Figure 3.1 Relationship between Power Supply Voltage and Load Resistance (4 to 20 mA DC Output)

(2) Pulse output and Alarm, Status Output

This version uses three wires between the converter and the power supply. A DC power and load resistance are required, and pulse output is connected to a totalizer or an electric counter. Low level of the pulse output is 0 to 2V. No communication is possible over a transmission line. Communication via the amplifier board is always possible irrespective of the wiring condition.

(3) Simultaneous Analog-Pulse Output

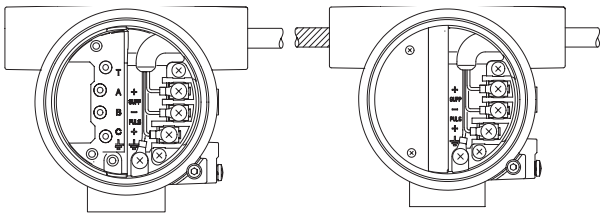
When using digitalYEWFLO in the simultaneous analog -pulse output mode, the communicable distance of the transmission line is restricted on the wiring method. Table 3.1 shows the examples of connection for this output mode. Communication via the amplifier board is always possible irrespective of the wiring condition.

IMPORTANT

For pulse output and the simultaneous analog-pulse output ,use the load resistance. Refer to Table 3.1.

3.3 Connection

Table 3.1 shows the connection sample of connection for power supply and load resistance. The terminal position of each connection is shown in Figure 3.2.



Integral type Remote type

T	Input Terminal from built-in temperature sensor		
A B	Input Terminals from vortex detector	Supply + – Pulse + –	4 to 20 mA DC Output Power Supply and Output Signal Terminals
C	Common Terminal		Pulse Output Terminal

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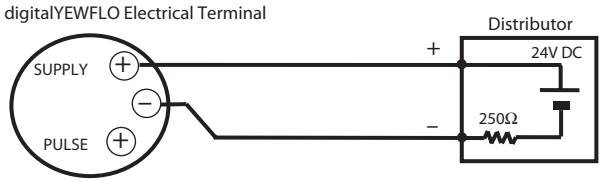
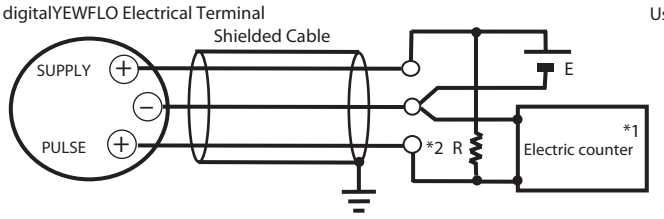
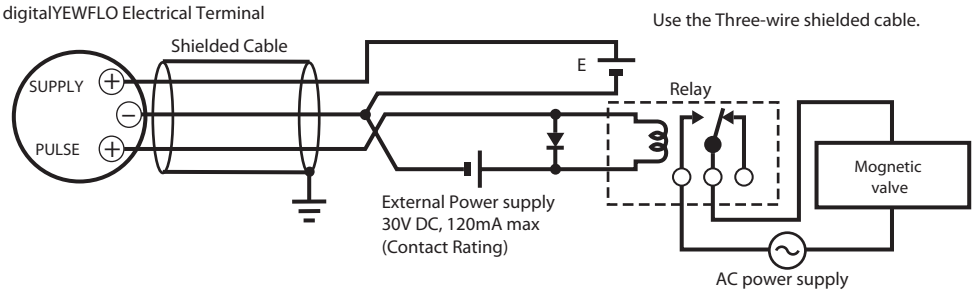
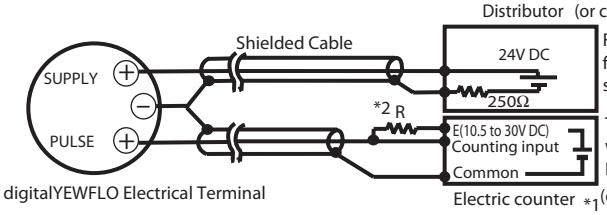
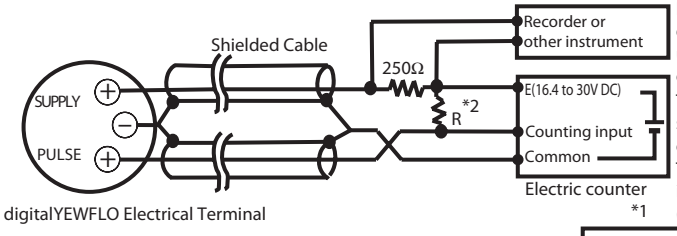
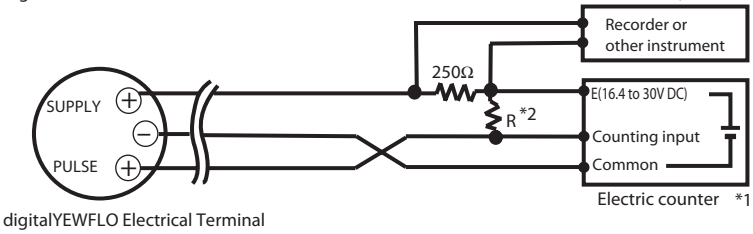
Figure 3.2

Table 3.1 The connection example for simultaneous analog and pulse and alarm, status output.

Connection	Description
Analog Output In this case, Communication is possible (up to a distance of 2km when a CEV cable is used.)	
Pulse Output In this case, No communication is possible.	
Status Output **Alarm Output** In this case, No communication is possible.	
Simultaneous Analog -Pulse Output Example 1 In this case, Communica -tion is possible(up to a distance of 2km when a CEV cable is used).	When analog and pulse output are used, the length of communication line is subjected to wiring conditions. Refer to example 1 to 3. If the communication carries out from amplifier, no need to consider wiring conditions.  For the shielded cables in this example of flowmeter installation, use two-wire separately shielded cables. This supply voltage requires a power sourse with a maximum output current of no less than E/R.
Example 2 In this case, Communica -tion is possible (up to a distance of 200m when a CEV cable is used) and R = 1kΩ).	 For the shielded cables in this example of flowmeter installation, use two-wire separately shielded cables. This supply voltage requires a power sourse with a maximum output current of no less than E/R+25mA. The supply voltage requires output impedance no more than 1/1000 of R (load resistance).
Example 3 In this case, No communi -cation is possible (when shielded cable is not used).	 This supply voltage requires a power sourse with a maximum output current of no less than E/R+25mA.
The range of load resistance R for the pulse output.	The load resistance of pulse output should be used to 1kΩ, 2W. If no translation of the pulse output possible by the cable length or the frequency of the pluse output, the load resistance should be selected by calculation as shown below. $\frac{E\,(V)}{120} \le R\,(k\Omega) \le \frac{0.1}{C\,(\mu F) \times f\,(kHz)}$ Example of CEV cable capacitance 6 0.1μF/km $P\,(mW) = \frac{E^2\,(V)}{R\,(k\Omega)}$ Where E = Supply voltage (V) f = Frequency of pulse output (kHz) R = Value of load resistance (kΩ) C = Cable capacitance (μF) P = Power ratio of the load resistance (mW)

*1 : To avoid the influence of external noise, use an electric counter which fits to the pulse frequency.
*2 : Resistor is not necessary in case of an electric counter which can receive contact pulse signal directly.

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3.4 Wiring Cables and Wires

The following should be taken into consideration when selecting cables for use between the converter and distributor.

(1) Use 600V PVC insulated wire or equivalent standard wire or cable.
(2) Use shielded wire in areas susceptible to electrical noise (both analog and pulse output versions).
(3) In areas with high or low ambient temperatures, use wires or cables suitable for such temperatures.
(4) In atmospheres where oils or solvents, corrosive gases or liquids may be present, use suitable wires or cables.
(5) Use cable which withstand temperature up to 60°C and more, when ambient temperature is more than 60°C.

IMPORTANT

For the remote type, use DYC signal cable to connect the converter and remote type flowmeter(DY-N).

3.5 Connection of the Remote Type Signal Cable

The remote type signal cable is shown in Figure 3.3 and 3.4, and the terminal is shown in Figure 3.5.

The maximum cable length is 30 m (97.5 feet).

Remove terminal box cover and wiring connection dust-cap before wiring.

For remote type the converter has two electrical connections (cable inlets). Use the left connection as viewed from the terminal box for the DYC signal cable and the right connection for the transmission cable.

If a signal cable kit is supplied by YOKOGAWA, both ends of the cable must be finished in accordance with the following instructions as shown in 3.6.1 and 3.6.2.

CAUTION

After completing the signal cable connections, install the shielded cover to signal cable terminal as shown in Figure 3.6.

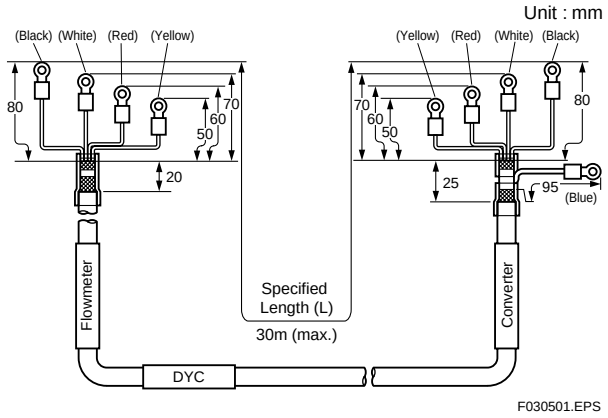


Figure 3.3 DYC Signal Cable

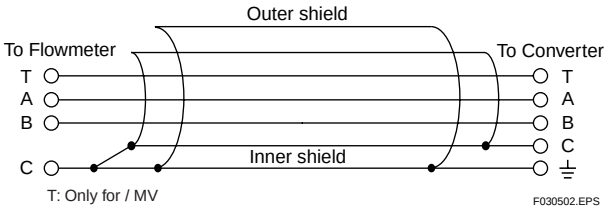
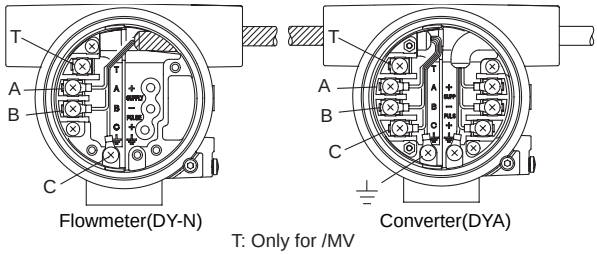


Figure 3.4 Construction of Remote Type Signal Cable



T	Input Terminal from built-in temperature sensor		
A B	Input Terminals from vortex detector	Supply 1 –	4 to 20 mA DC Output Power Supply and Output Signal Terminals
C	Common Terminal	Pulse 1	Pulse Output Terminal

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Figure 3.5 Terminal of Detector and Converter

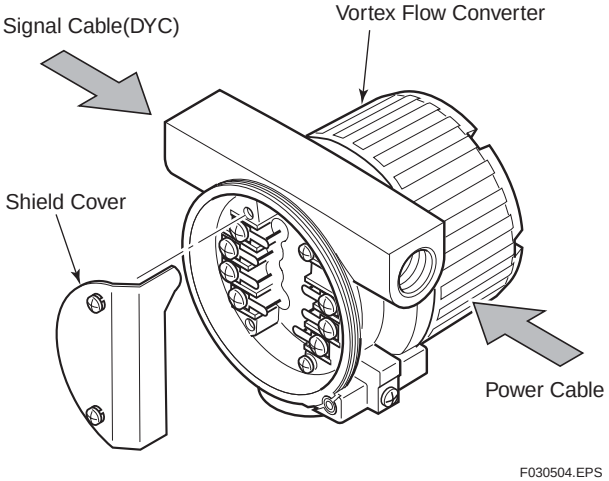
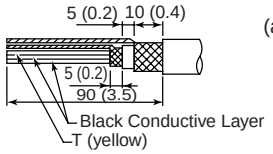
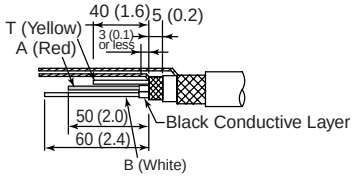
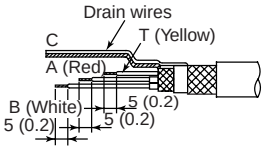
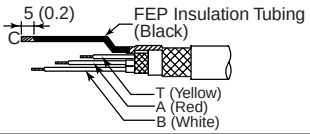
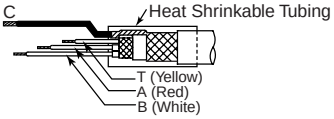
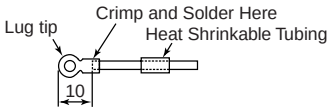
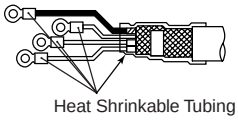
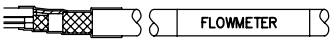


Figure 3.6 Shielded Cover

3.6 Method of Finishing the Signal Cable End(DYC)

3.6.1 For Vortex Flowmeter (DY-N)

	Description	Figure
1	Strip off the outer polyethylene jacket, outer braided shield and inner jacket, and inner braided shield as per the dimensions below.	Unit : mm (approx. inches) 
2	Strip off the black conductive layer convering two wires completely, as per the dimensions below. Twist each of the conductor and drain wires so that there are no free strands.	
3	Do not short-circuit the conductive layer and the terminals (A, B, C and T).	
4	Strip off about 5 mm (0.2 in.) of insulation for each of wires A, B, and T, and twist the strands of each wire. Twist the inner and outer drain wires together.	
5	Slide FEP (fluorinated ethylene propylene) tubing over the twisted inner and outer drain wires C until the tubing cannot be slid any further, and then cut off the tubing leaving 5 mm (0.2 in.) of the stranded drain wires exposed.	
6	Slide heat shrinkable tubing over the cable end so that the tubing covers the braided shield and overlaps both the polyethylene jacket and loose wires A, B, C, and T.	
7	Slide a short piece of heat shrinkable tubing over each of wires A, B, C, and T. Install a crimp-on terminal lug at the tip of each wire. Crimp and solder each lug.	
8	Slide each short piece of heat shrinkable tubing over the crimp sleeve. Heat all pieces of heat shrinkable tubing with a heat blower or dryer.	
9	Attach an identification label to the end of the cable.	

(*1): Only for /MV

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NOTE

Check that the insulation resistance between each wire including the inner shield is 10MΩ or greater at 500V DC. Ensure that both ends of the wires are disconnected (open-circuited) during the check.

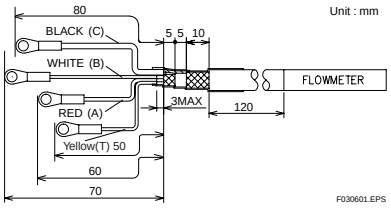


Figure 3.7

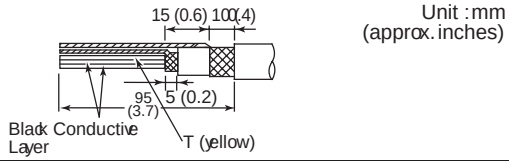
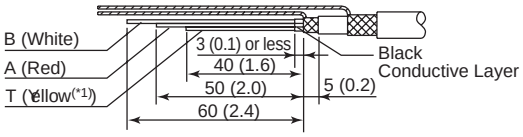
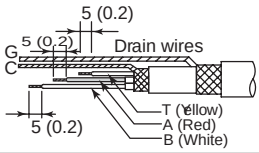
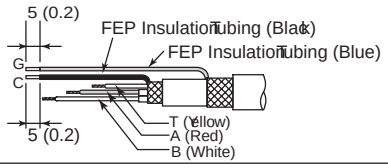
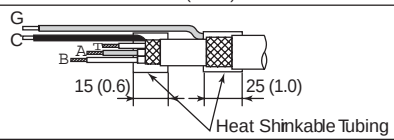
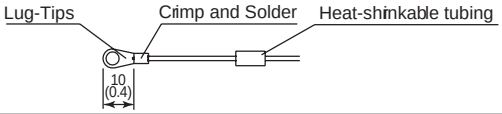
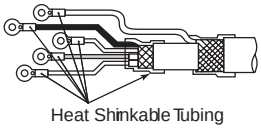
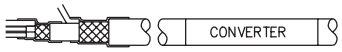
NOTE

In case that the cable end finish parts assembly is necessary after delivery, contact your nearest Yokogawa sales office or the sales representative from which you purchased the product. The parts number of DYC cable end finish parts assembly:
Standard type: F9399AB
Multivariable type (/MV): F9399AD

CAUTION

Do not touch the " conductive layer" (black area covering the signal cables A and B) to the converter case, terminal, and other leadwires. If it is touched, operation of the converter may be incorrect. When the cable is terminated, remove the conductive layer properly.

3.6.2 For Vortex Flow Converter (DYA)

	Description	Figure
1	Strip off the outer polyethylene jacket, outer braided shield and inner jacket, and inner braided shield as per the dimensions as shown.	
2	Cut of the black conductive layers(convering the two wires) completely, as per the dimensions below. Twist each of the conductor and drain wires so that there are no free strands.	
3	Do not short-circuit the conductive layer and the terminals (A, B, C, G and T).	
4	Strip off about 5 mm (0.2 in.) of insulation on each of wires A, B and T, and twist the strands of each wire.	
5	Slide black FEP (fluorinated ethylene propylene) tubing over the inner shield drain wire C and blue FEP tubing over outer shield drain wire G until the tubing cannot be slid any further, and then cut off the tubing leaving 5 mm (0.2 in.) of the drain wires exposed.	
6	Slide heat shrinkable tubing over the cable end so that the tubing covers the braided shield and overlaps both the polyethylene jacket and loose wires A, B, C, G, and T.	
7	Slide a short piece of heat shrinkable tubing over each of wires A, B, C, G, and T. Install a crimp-on terminal lug at the tip of each wire. Crimp and solder each lug.	
8	Slide each short piece of heat shrinkable tubing over the crimp sleeve. Heat all pieces of heat shrinkable tubing with a heat blower or dryer.	
9	Attach an identification label to the end of the cable.	

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(*1):Only for /MV

NOTE

Check that the insulation resistance between each wire including the inner shield is 10MΩ or greater at 500V DC. Ensure that both ends of the wires are disconnected (open-circuited) during the check.

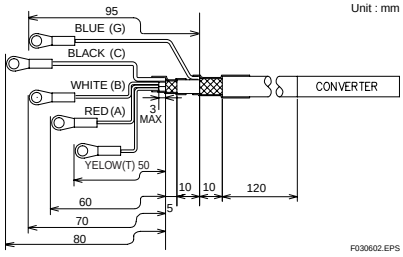

Figure 3.8

NOTE

In case that the cable end finish parts assembly is necessary after delivery, contact your nearest Yokogawa sales office or the sales representative from which you purchased the product.
The parts number of DYC cable end finish parts assembly:
Standard type: F9399AA
Multivariable type (/MV): F9399AC

CAUTION

Do not touch the " conductive layer" (black area covering the signal cables A and B) to the converter case, terminal, and other leadwires. If it is touched, operation of the converter may be incorrect. When the cable is terminated, remove the conductive layer properly.

3.7 Wiring Cautions

(1) Lay wiring as far as possible from electrical noise sources such as large transformers, motors and power supplies.
(2) It is recommended that crimp-on type solderless lugs be used for large wire ends.
(3) For general use, it is recommended that conduits and ducts or racks be used to protect wiring from water or mechanical damage. A rigid steel conduit or flexible metal conduit is recommended. See Figure 3.9.

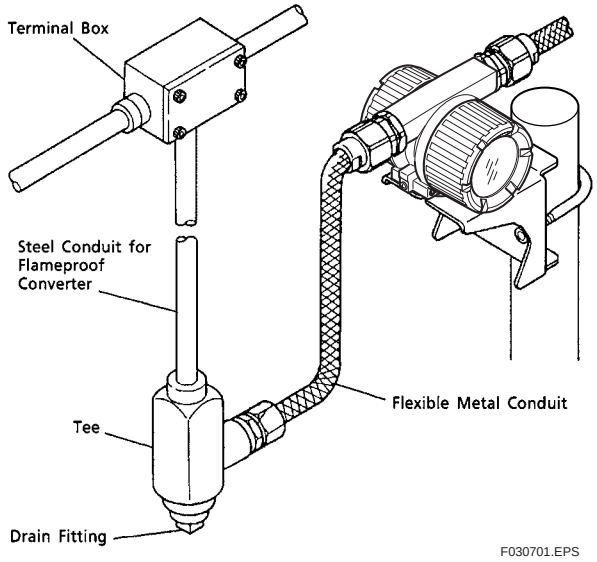

Figure 3.9

3.8 Grounding

IMPORTANT

When a lightning protector (option code: /A) is selected, use a grounding resistance of 10Ω or less.

(1) The grounding terminals ⏚ are located on the inside and outside of the terminal area. Either terminal may be used.
(2) For pulse output version, ground the flowmeter. Also ground the shielded cable between the converter and the pulse receiver.
(3) Grounding should satisfy Class D requirements (ground resistance 100Ω or less).
(4) Use 600V PVC insulated wire for grounding.

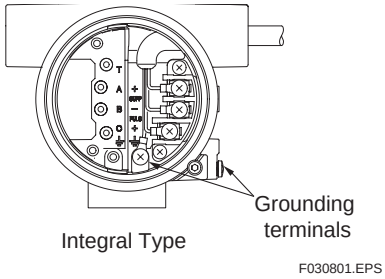

Figure 3.10

4. BASIC OPERATING PROCEDURES

Data setting can be performed with the three keys on the front panel (SET,SHIFT and INC) or using a handheld BRAIN(BT) terminal and HART communicator.

4.1 Construction of the Display

Figure 4.1 shows the configuration of the digitalYEWFLO display panel (if equipped).

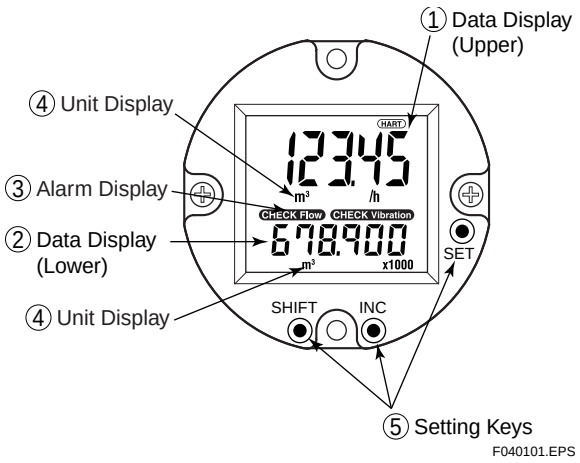

Figure 4.1 Construction of the Display

① Data Display(Upper) : Displays flowrate data, setting data, total data.
② Data Display(Lower) : Displays total data, alarm data.
③ Alarm Display : Displays alarm of a flow error and a vibration error.
④ Unit Display : Displays Flowrate unit.
⑤ Setting Keys : These keys are used to change flow rate data displays and type of setting data.

Description of unit indications and its votes.

Table 4.1 shows the description of unit indications and it's votes.

Table 4.1 Unit Indicator

Unit	Upper Indication	Lower Indication
%	○	×
m^3	○	○
	○	○
Nm^3	○	○
N	○	○
Sm^3	○	○
S	○	○
kg	○	○
t	○	○
/h	○	×
/m	○	×
/s	○	×
/d	○	×
°C	×	○ (*1)

(*1) Only for /MV

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4.2 Display Contents in Display Section

The display content items are classified in the following three items.

Table 4.2 Mode Name List

Mode (status) Name	Display Contents
Flowrate display mode	A mode in which instantaneous flow rates or totalized values are displayed. Display content is usually selected either in display content selection mode or by setting parameters via BRAIN communication.
Setting mode	In this mode, parameter contents are confirmed or data is updated using the setting section. The mode is changed to this mode when [SET] key is pressed in normal mode.
Alarm number display mode	This mode is overlapped when an alarm is occurring in display mode. The alarm number presentation to indicate alarm contents (about 2 sec) and the normal data display (about 4 sec) are repeated alternatively.

Mode represents that the system is in a state where the relevant setting or display is possible.

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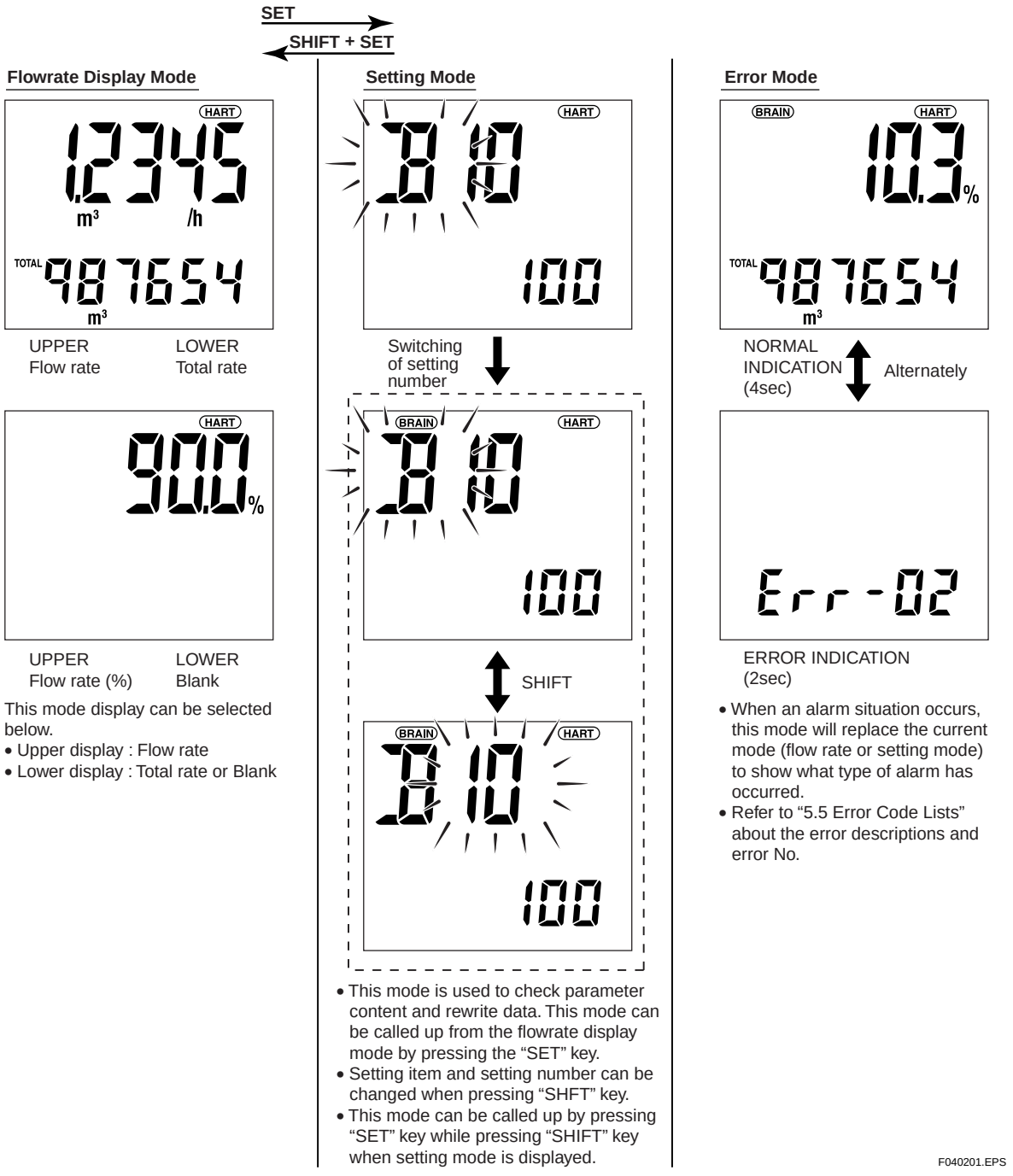
l Display Example


SET
SHIFT + SET
Flowrate Display Mode
Setting Mode
Error Mode
HART
BRAIN
12345
m³
/h
TOTAL
987654
m³
100
10.3
%
UPPER
Flow rate
LOWER
Total rate
Switching of setting number
NORMAL INDICATION (4sec)
Alternately
90.0
%
UPPER
Flow rate (%)
LOWER
Blank
SHIFT
Err-02
ERROR INDICATION (2sec)
This mode display can be selected below.
• Upper display : Flow rate
• Lower display : Total rate or Blank
• This mode is used to check parameter content and rewrite data. This mode can be called up from the flowrate display mode by pressing the “SET” key.
• Setting item and setting number can be changed when pressing “SHFT” key.
• This mode can be called up by pressing “SET” key while pressing “SHIFT” key when setting mode is displayed.
• When an alarm situation occurs, this mode will replace the current mode (flow rate or setting mode) to show what type of alarm has occurred.
• Refer to “5.5 Error Code Lists” about the error descriptions and error No.

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4.3 Display Contents in Display Section

The display mode is a mode in which instantaneous flow rates or totalized flow are displayed. In display mode, there are three display modes as shown in Table 4.3.

Table 4.3 Display Mode

Name	Contents	Upper Display	Lower Display
% Display (Flow rate)	Instantaneous % flow rate is displayed.	○	×
Engineering Display Unit	Instantaneous flow rate in an engineering unit is displayed.	○	×
Totalized Display	Totalized flow displayed without indicating the decimal point.	×	○
% Display (Temperature) (*1)	Instantaneous temperature is displayed. In this case, "t" is displayed simultaneously (Refer to Figure 4.2).	○	×
Temperature display(*1)	Temperature value is displayed.	×	○
Blank	—	×	○

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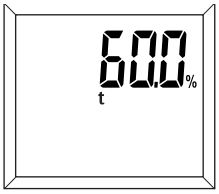
(*1) When option code /MV is selected, this function is available.



F040301.EPS

Figure 4.2 Example

Display mode can be changed using the BT200 terminal or the indicator setting section.

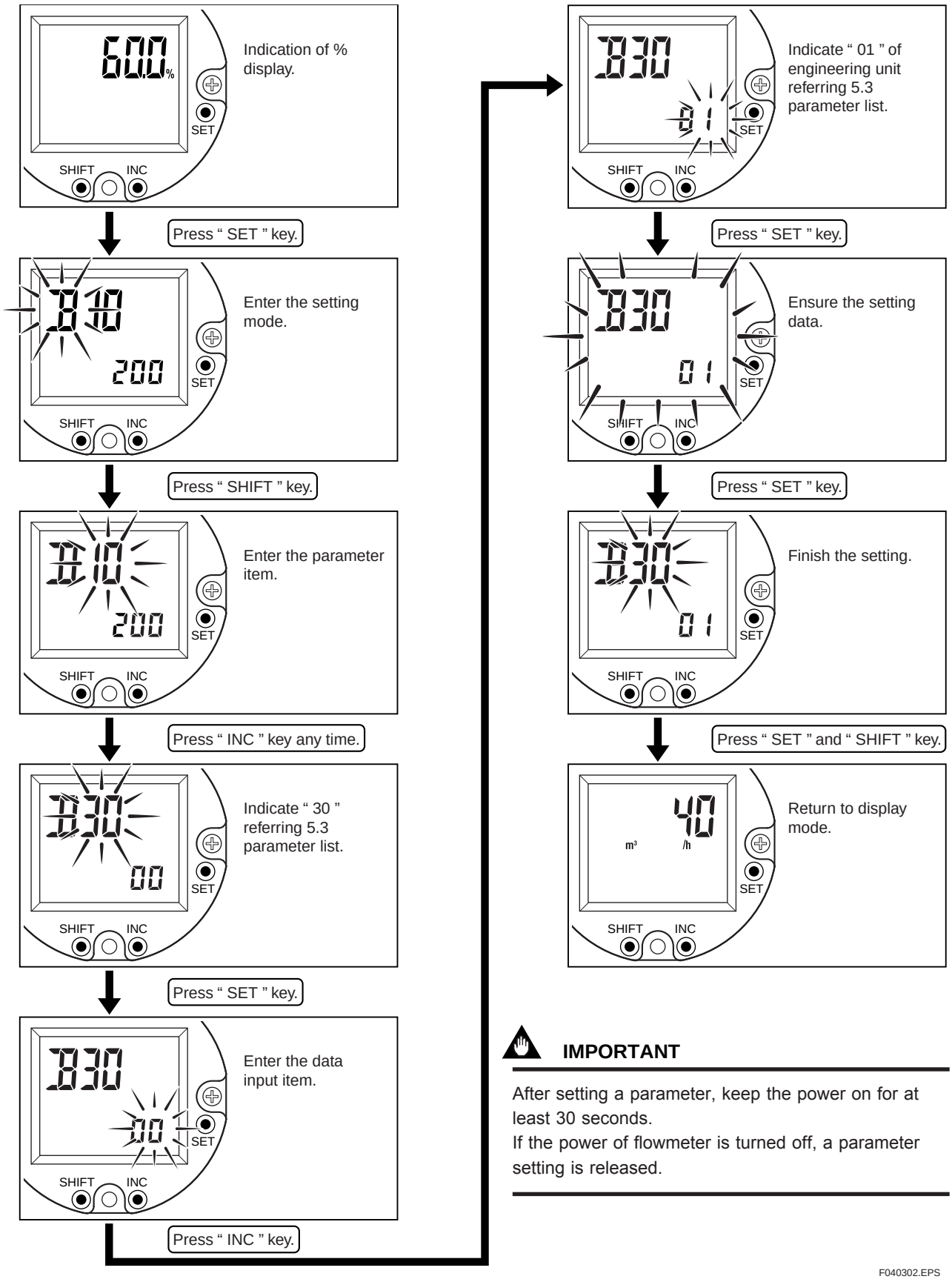
- For operation using BT200, perform changes using the parameter item " B30:UPPER DISP" and "B31:LOWER DISP" referring to section 5. Parameters.
- For operation using indicator, change B30 and B31 parameter item number to display an appropriate display.

IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

4.3.1 Change the Display Mode from % Display to Engineering Unit

The display mode can be changed referring 5.3 parameter list.



IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

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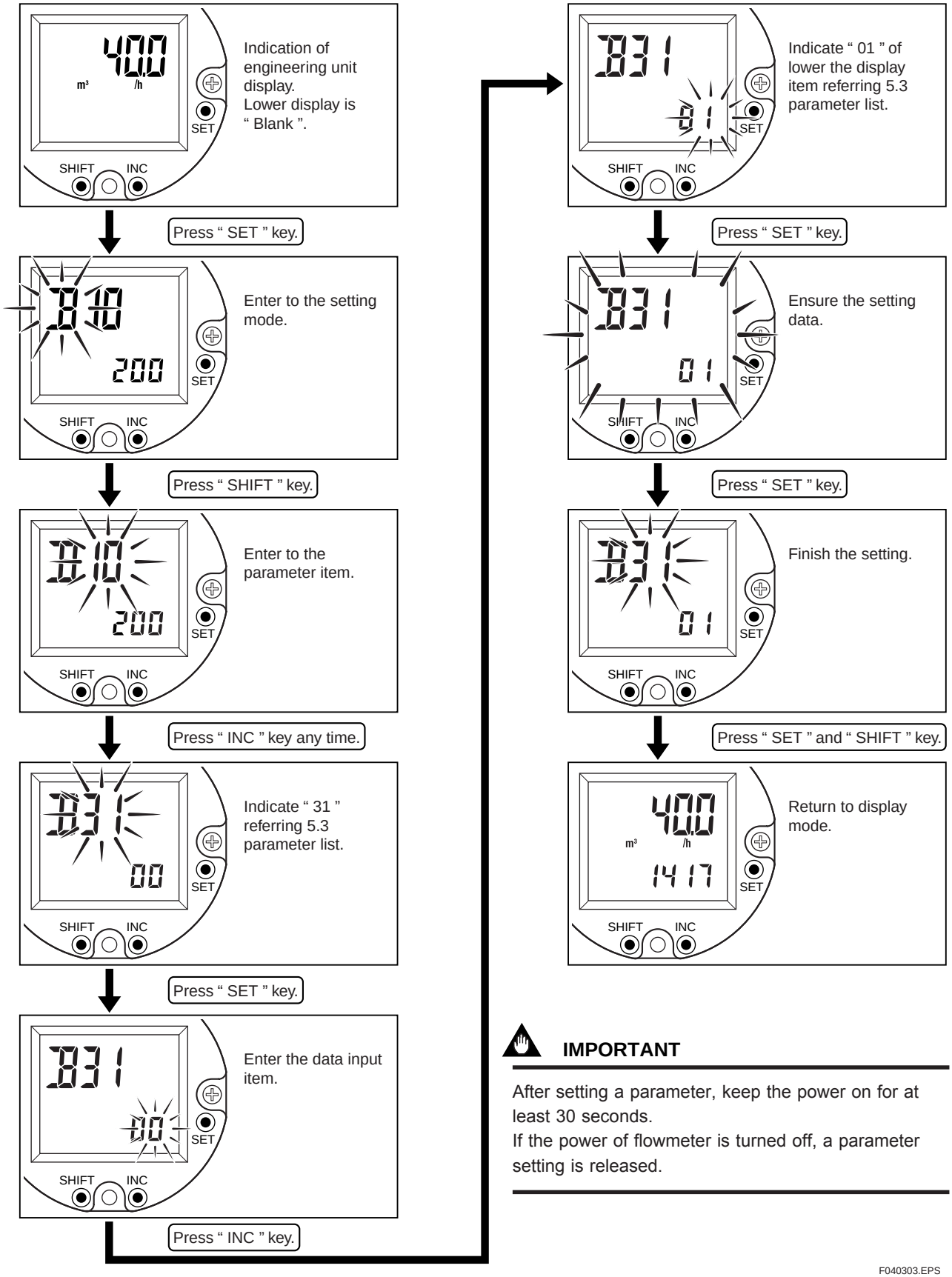
4.3.2 Indicate the Total Rate in the Lower Display

The display mode can be changed referring 5.3 parameter list.


Indication of engineering unit display. Lower display is " Blank ".
Press " SET " key.
Enter to the setting mode.
Press " SHIFT " key.
Enter to the parameter item.
Press " INC " key any time.
Indicate " 31 " referring 5.3 parameter list.
Press " SET " key.
Enter the data input item.
Press " INC " key.
Indicate " 01 " of lower the display item referring 5.3 parameter list.
Press " SET " key.
Ensure the setting data.
Press " SET " key.
Finish the setting.
Press " SET " and " SHIFT " key.
Return to display mode.
SET
SHIFT
INC

IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

F040303.EPS

4.4 Setting Mode

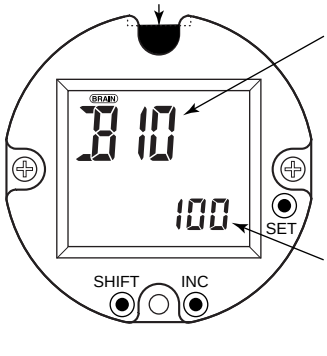
The setting mode is used for checking parameters and rewriting data. The following is an overview of the setting mode.

NOTE

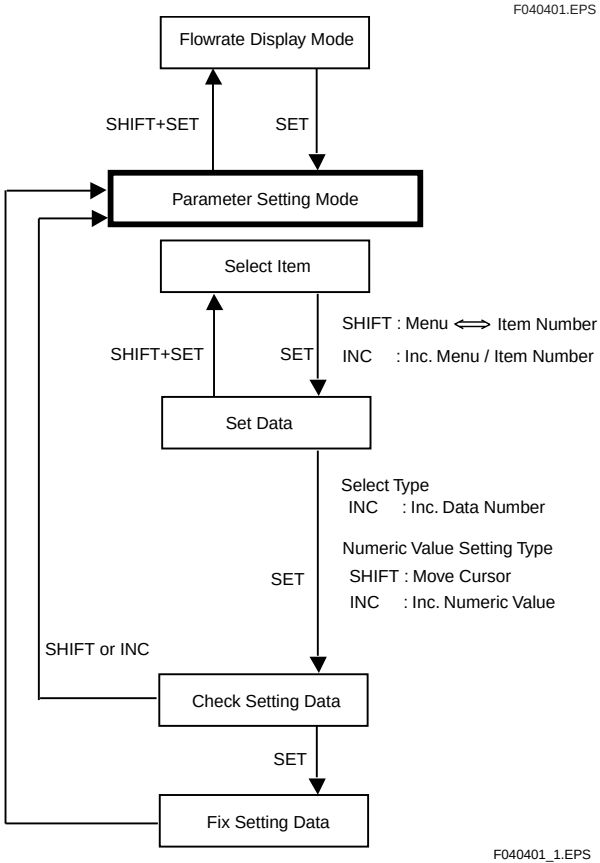
- Refer to 5.3 Parameter List and 5.4 Parameter description for information on how to change setting.

4.4.1 Structure of Setting Mode Display

Simple parameter sheet
IN this sheet, a setting flow chart and the parameter list required to operate digitalYEWFLO is indicated.



F040401.EPS



F040401_1.EPS

Figure 4.3 Indicator Construction and Parameter Setting Procedure

- When completing setting, press "SHIFT" key and "SET" key simultaneously. The mode move to the "display mode".

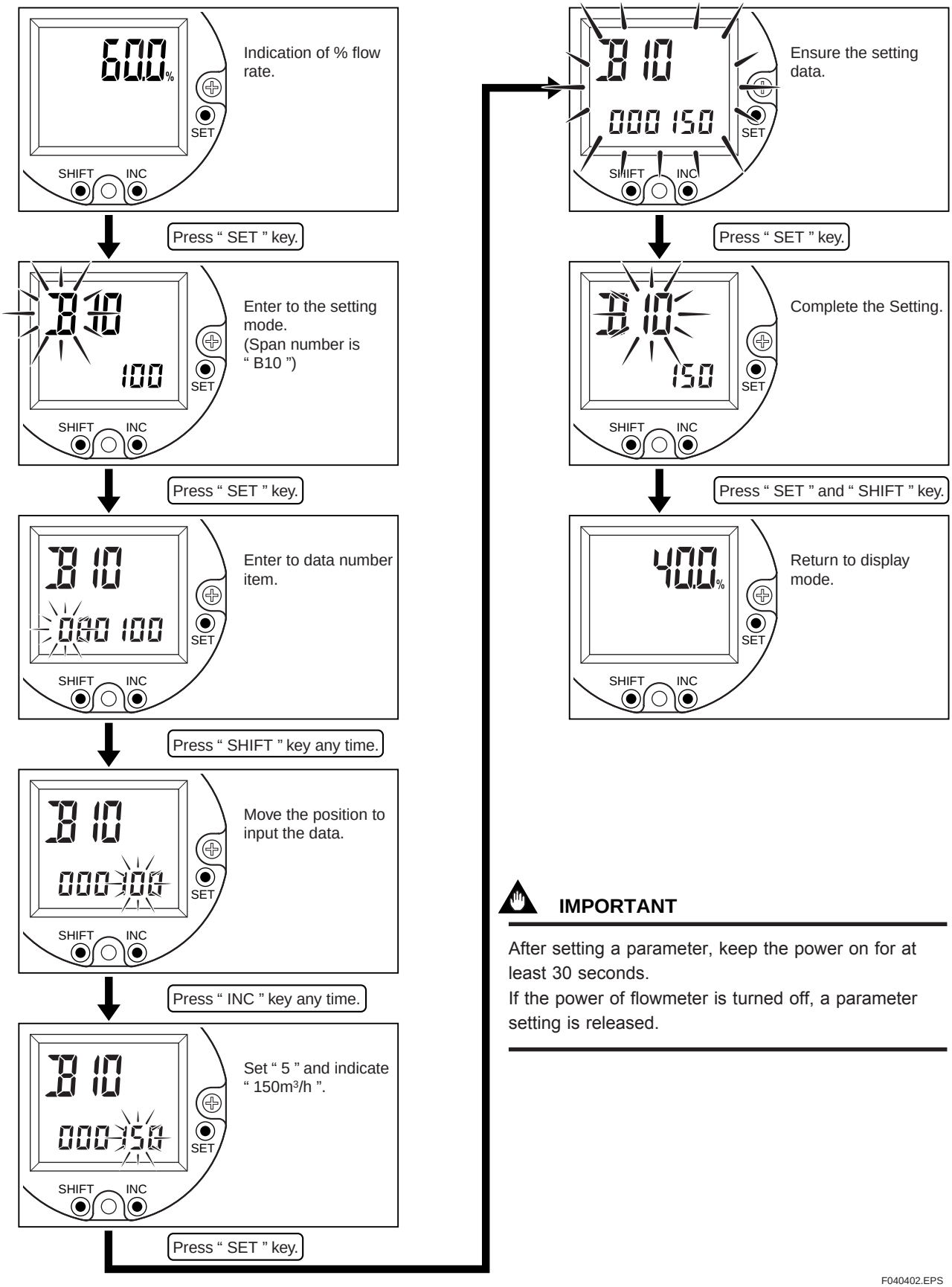
IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

4.4.2 Method of Parameter Setting

Input method of numeric data

Example 1: Change the span from 100m³/h to 150m³/h
The setting mode can be changed referring 5.3 parameter list



IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

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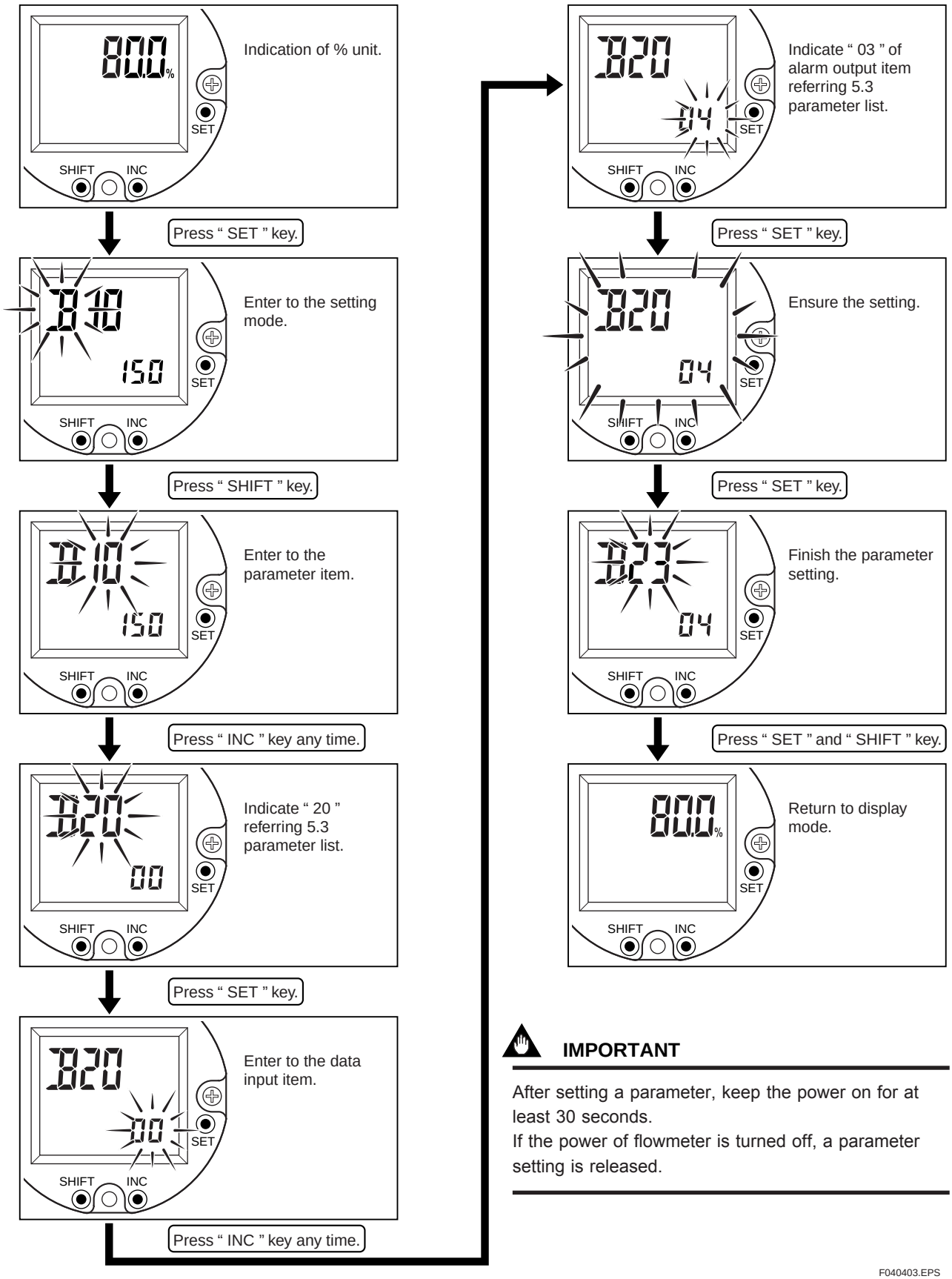
Input method of selection items

Example 2: Change the pulse output to alarm output.
The setting mode can be changed referring 5.3 parameter list


Indication of % unit.
SET
SHIFT
INC
Press " SET " key.
Enter to the setting mode.
Press " SHIFT " key.
Enter to the parameter item.
Press " INC " key any time.
Indicate " 20 " referring 5.3 parameter list.
Press " SET " key.
Enter to the data input item.
Press " INC " key any time.
Indicate " 03 " of alarm output item referring 5.3 parameter list.
Press " SET " key.
Ensure the setting.
Press " SET " key.
Finish the parameter setting.
Press " SET " and " SHIFT " key.
Return to display mode.

IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

F040403.EPS

4.5 Operation for the BT200

This section describes the operation procedures using a BRAIN Terminal (BT200). For details on the functions of the digitalYEWFLO, refer to 5.3 Parameter List. And also, see the "BT200 Instruction Manual" (IM 1C0A11-01E) for more detailed Information.

4.5.1 Connection Method for the BT200

(1) Connecting the BT200 to a 4 to 20mA DC Transfer Line

The communication signal of the digitalYEWFLO is superimposed onto the 4 to 20mA DC analog signal to be transferred.

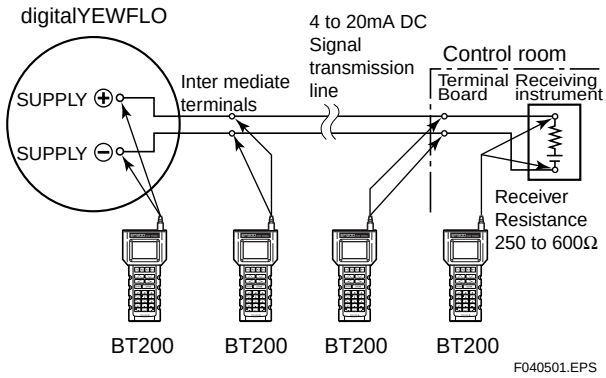


Figure 4.4 Communicating for a 4 to 20mA DC Signal Line

IMPORTANT

The communicable distance of the transmission line is restricted depending on the wiring method. Refer to 3. WIRING.

IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

(2) Connecting BT200 to Flow Converter

Removing a cover and indicator, the terminals for brain communication are provided on the circuit board. Connect BT200 to the terminal of HHT-COM on the circuit board.

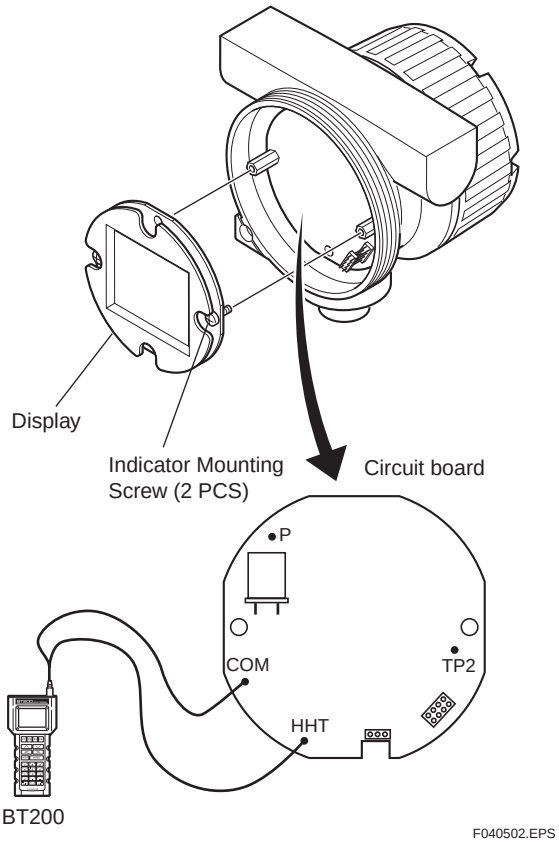
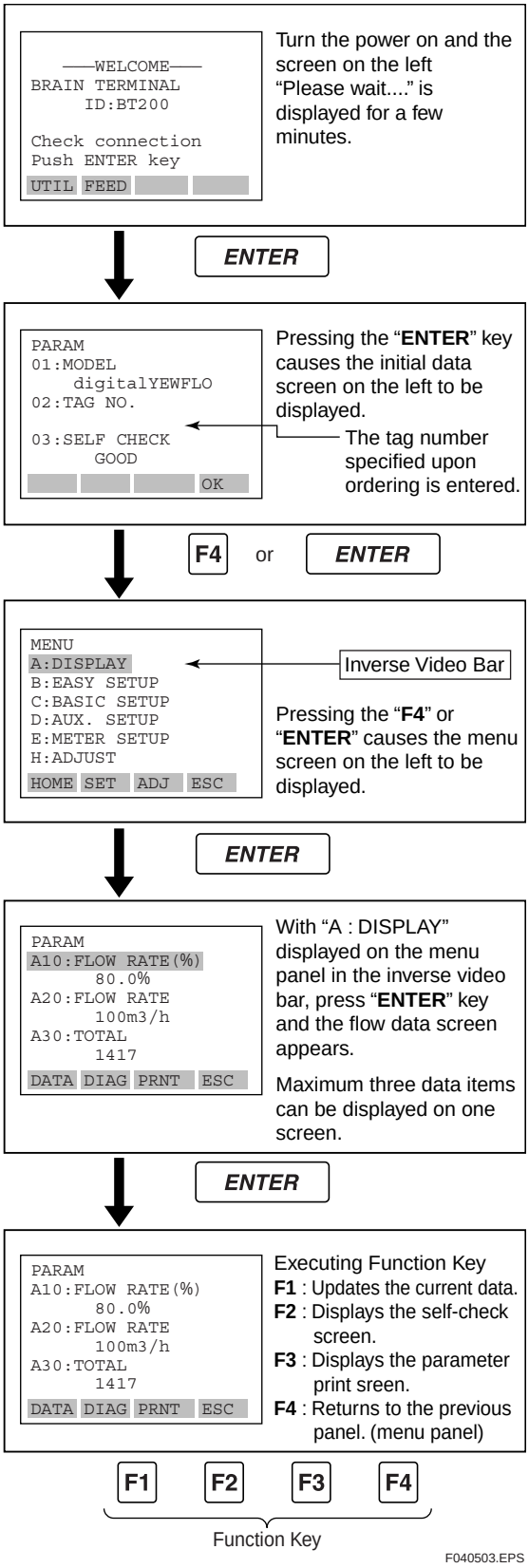


Figure 4.5 Connection of BT200 to Flow Converter

4.5.2 Displaying Flow Rate Data

Flowrate data can be displayed on the BT200 screen according to the following procedure.



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Function key

The functions of the function keys vary with the commands being displayed on the display panel.

Table 4.4

Command	Description
ADJ	Calls up the adjustment menu.
CAPS/caps	Changes the uppercase / lowercase mode.
CLR	Clears entered data / deletes all data.
COPY*	Prints parameters on the screen.
DATA	Updates parameter data.
DEL	Deletes one character.
DIAG	Calls up the self-check screen.
ESC	Returns to the preceding screen.
FEED*	Paper feed.
HOME	Calls up the home menu (A : DISPLAY).
LIST*	Prints all parameters of the menus.
NO	Setting stop / re-setting. Returns to the previous screen.
OK	Goes to the next screen.
PARM	Parameter number setting mode.
PON/POFF*	Printer output of data whose setting was changed Mode on / off.
PRNT*	Changes to the prints mode.
SET	Calls up the setting menu (B : SETTING).
SLOT	Returns to the slot selection screen.
GO*	Starts print out.
STOP*	Stops printing.
UTIL	Transfers to the utility screen.

*The command is available only for BT-200-P00

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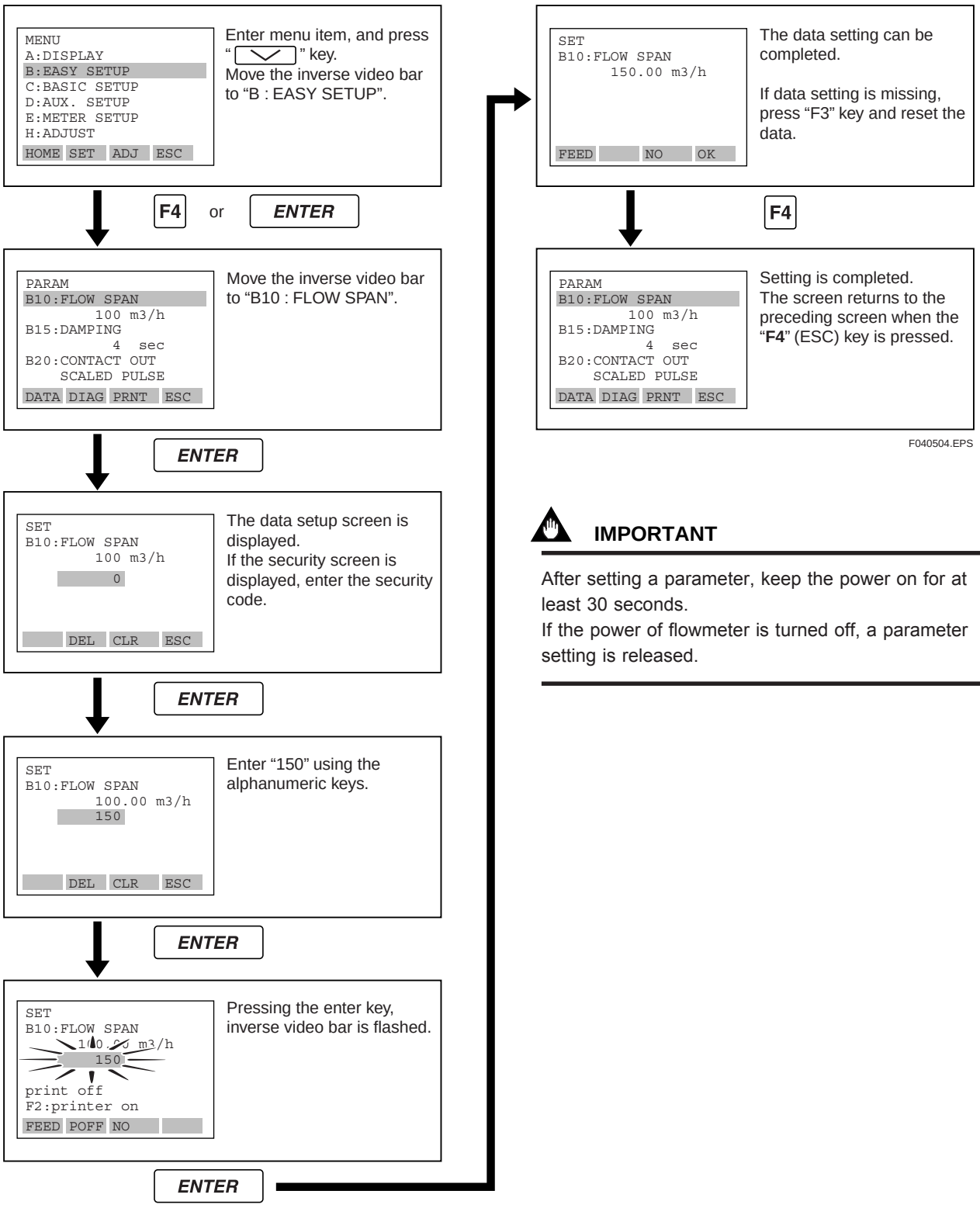
4.5.3 Setting Parameters

This section describes the setting method using a BRAIN Terminal (BT200). For details on the method, refer to 5.3 Parameter List.

(1) Setting Flow Span

Example : Change flow span 100m³/h to 150m³/h

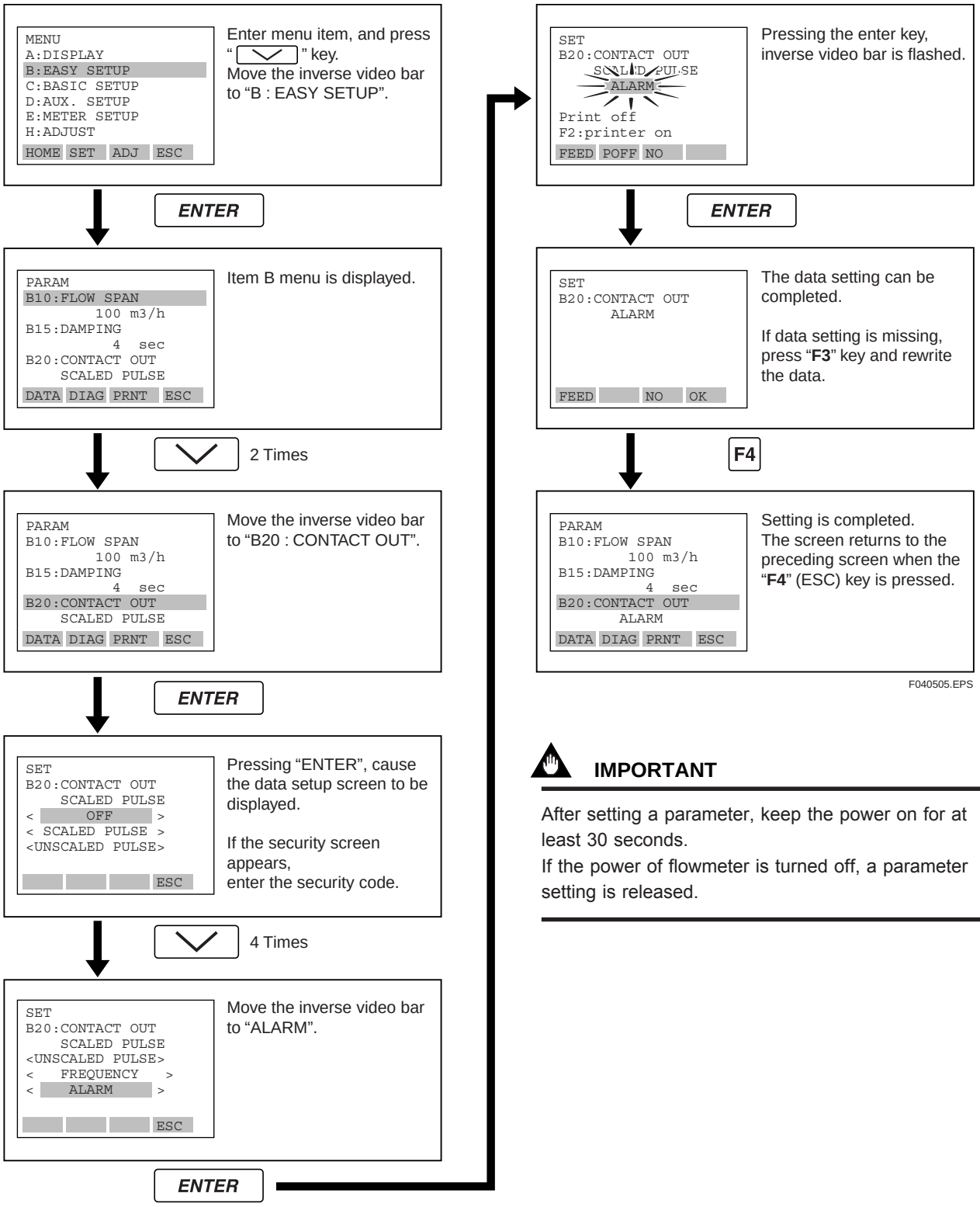


F040504.EPS

IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

(2) Change the Pulse Output to Alarm Output.



F040505.EPS

IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

4.6 Operation for HART Communicator

The communication control function with HHT, BRAIN Terminal (BT200) is stated at 4.5 Operation for the BT200. digitalYEWFLO is available not only BRAIN Terminal (BT200) but also HART Communicator as remote control via HHT.

Main functions and parameters are the same with BRAIN Terminal (BT200). Moreover, digitalYEWFLO has unique parameters of HART Communicator.

The amplifier has been pre-configured at the factory, so no setup should be required prior to installation. If your process conditions have changed and reprogramming is required, the menu/parameter configuration list for digitalYEWFLO is in 4.6.12 Menu Tree. Refer to the instructions provided with your HART communicator for operation details. The QUICK START section of this manual will address only those parameters which must be set to establish the operation of the meter for a particular application. The Menu Tree will cross-reference the BRAIN parameters to the corresponding HART parameters.

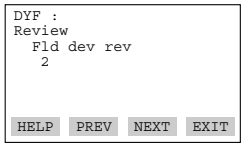
Note: HART is a registered trademark of the HART Communication Foundation.

CAUTION

Matching of communicator DD and instrument DD
Before using the Model 275 HART Communicator, check that the DD (Device Description) installed in the communicator matches that of the instruments to be set up. To check the DD in the instrument or the HART Communicator, follow the steps below. If the correct DD is not installed in the communicator, you must upgrade the DD at the official HART programming sites. For communication tools other than Model 275 HART Communicator, contact the respective vendors for upgrade information.

1. Checking the DD in the instrument
   1) Connect the communicator to the instrument to be set up.
   2) Open “Device Setup” and press [∅].
   3) Select “Review” and press [∅].
   4) By pressing [NEXT] or [PREV], locate “Fld dev rev” to show the DD of the instrument.

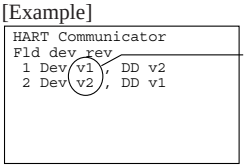
[Example]



“The instrument DD is Version 2”
F040601-1.EPS

2. Checking the DD in Model 275 HART Communicator.
   1) Turn on only the communicator alone.
   2) Select “Utility” from the main menu and press [∅].
   3) Select “Simulation” and press [∅].
   4) Select “YOKOGAWA” from the manufacturers list by pressing [¬] and then pressing [∅] to enter selection.
   5) Select the model name of the instrument (i.e. digitalYEWFLO) by pressing [¬] and then press [∅] to show the DD of the communicator.

[Example]



“The communicator DD supports Versions 1 and 2.”
F040601-2.EPS

NOTE

In case of using HART Communicator, setting from indicator is not available.

CAUTION

In case of using Burst mode, setting from amplifier unit is not available.

4.6.1 Interconnection between digitalYEWFLO and HART Communicator

The HART Communicator can interface with the digitalYEWFLO from the control room, the digitalYEWFLO site, or any other wiring termination point in the loop, provided there is a minimum load resistance of 230 ý between the connection and the receiving instrument. To communicate, it must be connected in parallel with the digitalYEWFLO, and the connections must be non-polarized. Figure 4.6 illustrates the wiring connections for a direct interface at the digitalYEWFLO site. The HART Communicator can be used for remote access from any terminal strip as well.

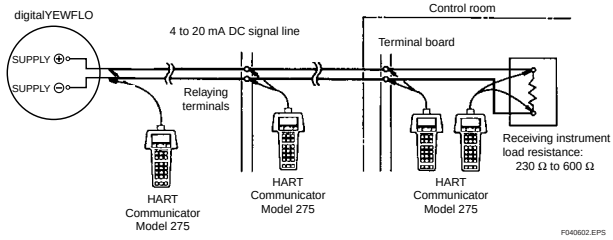


Figure 4.6 Interconnection Diagram

4.6.2 Keys and Functions of Model 275

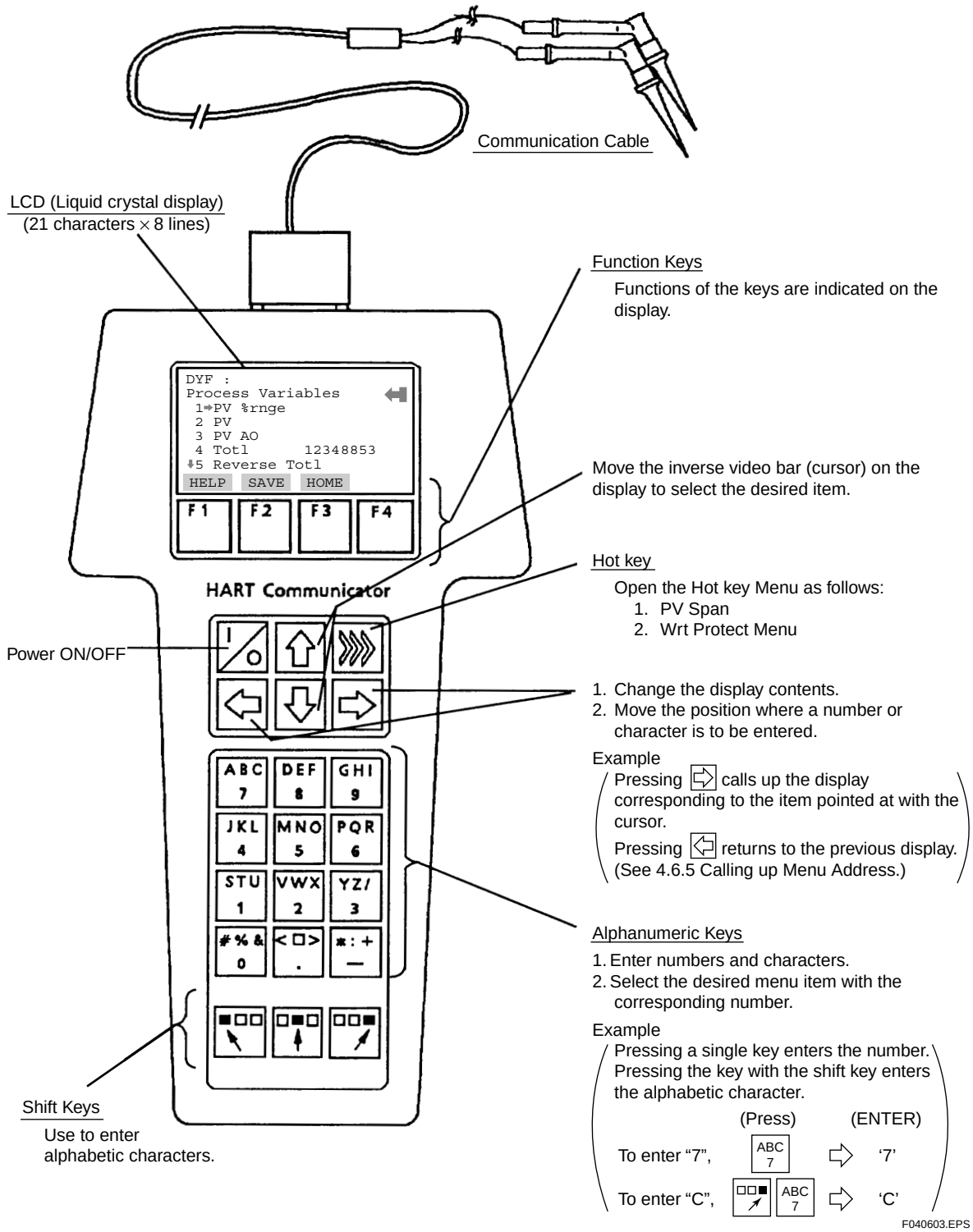

Communication Cable
LCD (Liquid crystal display)
(21 characters × 8 lines)
DYF :
Process Variables
1➡PV %rnge
2 PV
3 PV AO
4 Totl 12348853
⬇5 Reverse Totl
HELP SAVE HOME
F1 F2 F3 F4
HART Communicator
Power ON/OFF
Shift Keys
Use to enter alphabetic characters.
Function Keys
Functions of the keys are indicated on the display.
Move the inverse video bar (cursor) on the display to select the desired item.
Hot key
Open the Hot key Menu as follows:
1. PV Span
2. Wrt Protect Menu
1. Change the display contents.
2. Move the position where a number or character is to be entered.
Example
Pressing ⇨ calls up the display corresponding to the item pointed at with the cursor.
Pressing ⇦ returns to the previous display. (See 4.6.5 Calling up Menu Address.)
Alphanumeric Keys
1. Enter numbers and characters.
2. Select the desired menu item with the corresponding number.
Example
Pressing a single key enters the number. Pressing the key with the shift key enters the alphabetic character.
(Press) (ENTER)
To enter “7”, ABC 7 ⇨ ‘7’
To enter “C”, ABC 7 ⇨ ‘C’
F040603.EPS

Figure 4.7 HART Communicator

4.6.3 Display

The HART Communicator automatically searches for digitalYEWFLO on the 4 to 20 mA loop when it is turned on. When the HART Communicator is connected to the digitalYEWFLO, it displays "**Online**" menu as shown below. (If digitalYEWFLO is not found, the communicator displays the message "No Device Found. Press OK...." Press the OK 'F4' function key and the main menu appears. Retry after confirming the connection with the digitalYEWFLO.)

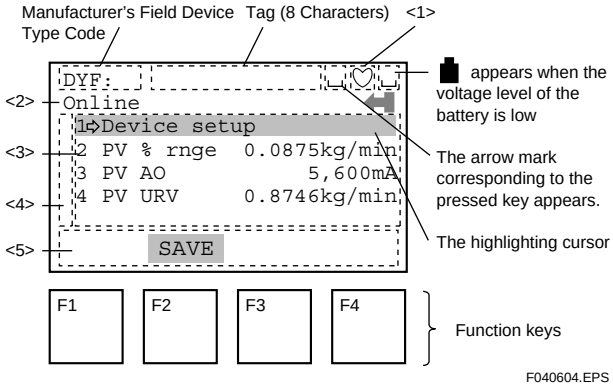


Figure 4.8 Display

<1> ♡ appears and flashes during communication between the HART Communicator and the digitalYEWFLO. At Burst mode*, ♥ appears.

<2> The current display menu title appears.

<3> Each item in menu of <2> appears.

<4> ↓ and/or ↑ appear when the items are scrolled out of the display.

<5> On any given menu, the label appearing above a function key indicates the function of that key for the current menu.

* Refer to 4.6.7 Unique Functions of HART Communicator

4.6.4 Calling Up Menu Addresses

4.6.11 Menu Tree shows the configuration of Online Menu which is needed for the operation with HART Communicator. The desired item can be displayed with ease by understanding the menu configuration.

When the HART Communicator is connected to the digitalYEWFLO, "**Online**" menu will be displayed after the power is turned on (See Figure 4.8). Call up the desired item as follows:

Example: Call up the "**Tag**" to change the tag number.

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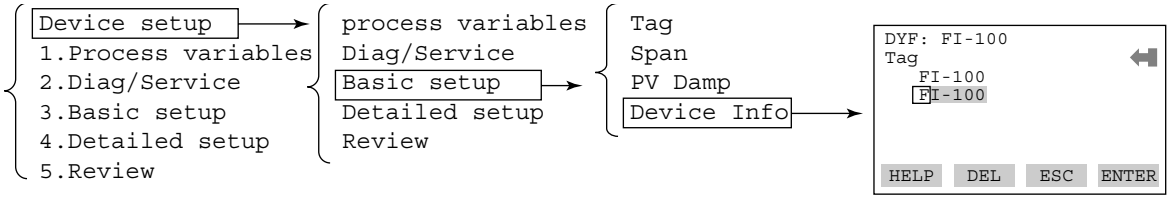
Key operation

There are two choices to select the desired menu item.

1. Use the ⇩ or ⇧ key to select the desired item, and then press the ⇨ key.
2. Press the number key displayed for the desired item.
   - To return to the previous display, press the ⇦ key, **EXIT (F4)** or **ESC (F3)**.

Check where "**Tag**" is located in the menu configuration. Then, call up "**Tag**" on the display according to the menu configuration.



	Display	Operation	
1	DYF : Online 1 Device setup 2 PV 3 PV AO 4 PV URV	⇨ or STU 1	Display 1 appears when the HART Communicator is turned on. Select "**Device setup**".
2	DYF : Device setup 1 Process variables 2 Diag/Service 3 Basic setup 4 Detailed setup 5 Review SAVE HOME	⇩ ×2 ⇨ or YZ / 3	Select "**Basic setup**".
3	DYF : Basic setup 1 Tag 2 Span 3 PV Damp 4 Device info HELP SAVE HOME	⇩ ×4 ⇨ or MNO 5	Select "**Tag**".
4	DYF : Tag FI-100 FI-100 HELP DEL ESC ENTER		The display for Tag setting appears. (The default value of "Tag" is blank.)

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NOTE

Setting parameters on the display unit of the digitalYEWFLO is not possible during HART Communication.

4.6.5 Entering, Setting and Sending Data

The data which are input with the keys are set in the HART Communicator by pressing **ENTER (F4)**. Then, by pressing **SEND (F2)**, the data are sent to the digitalYEWFLO. Note that the data are not set in the digitalYEWFLO if **SEND (F2)** is not pressed. All the data set with the HART Communicator is held in memory unless power is turned off, so every data can be sent to the digitalYEWFLO at one lot.

Operation

Entering data on the "**Tag**" setting display.
On alphabetic characters, only capital letters can be used for setting Tag No. with HART Communicator.

Example: Set "**FIC-1A**".

5. Tag

Call up "**Tag**" setting display.

1. Device setup → 3. Basic setup → **5. Tag**

1
```
DYF :
Tag

HELP  DEL  ESC  ENTER
```

On the setting display shown above, enter the data as follows:

Character to be entered	Operation	Display
F	DEF 8	F
I	GHI 9	F I
C	ABC 7	F I C
-	*:+ _	F I C -
1	STU 1	F I C - 1
A	ABC 7	F I C - 1 A

F040605_1.EPS

	Display	Operation	
1	DYF : Tag FIC-1A HELP DEL ESC ENTER	F4 (ENTER)	Press **ENTER (F4)** to set the data in the HART Communicator after entering the data.
2	DYF : Basic setup 1 Tag 2 Span 3 PV Damp 4 Device info HELP SEND HOME	F2 (SEND)	Press **SEND (F2)** to send the data to the digitalYEWFLO. * ♡ is flashing during communication.
3	DYF : Basic setup 1 Tag 2 Span 3 PV Damp 4 Device info HELP SAVE HOME		SEND label changed to SAVE label, and the transmission is completed. Press **HOME (F3)**, and return "Online Menu".

F040605_2.EPS

4.6.6 Parameters Configuration

IMPORTANT

Do not turn off the digitalYEWFLO just after HART Communicator settings (sending) have been made. If the digitalYEWFLO is turned off less than 30 seconds after parameters have been set, the set data will not be stored and the data returns to previous settings.

Parameters of HART Communicator is constructed hierarchically. The menu tree for Online menu is shown in 4.6.11 Menu Tree.

See 5.4 Parameter Description about the usage of each parameter. Note the differences between parameters on digitalYEWFLO display and those on HART Communicator.

The Online menu summary is shown below.

Table 4.6.1 Online Menu Summary

No.	Display Item	Contents
1	Device setup	Set parameters for digitalYEWFLO.
2	PV	Display process value in engineering unit.
3	PV AO	Display analog output in mA.
4	PV URV	Display set span in engineering unit.

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4.6.7 Unique Functions of HART Communicator

Check on communication error

When each error, over run framing error, parity error or buffer overflow error is detected, the data including the informations of errors is returned, and the error message is indicated on HHT.

Real time monitoring 4-20mA output

'%' output, actual flow rate and totalized value are mentioned as same as BRAIN communicator. And furthermore 4-20mA output is monitored on real time.

Time recording

Online ⇒ 1.Device setup ⇒ 4.Detailed setup
⇒ 4. Device info ⇒ 5.Date

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Day, month and year can be set in a number of 2 figures.

Multi drop communication

Field devices in multidrop mode refer to the connection of several field devices on a communication single line. Up to 15 field devices can be connected when set in the multidrop mode. To activate multidrop communication, the field device address must be changed to a number from 1 to 15. This change deactivates the 4 to 20mA output and turns it 4mA output and turns it 4mA.

Online ⇒ 1.Device setup ⇒ 4.Detailed setup
⇒ 4.Device info ⇒ 6.Dev id

F040606 2.EPS

Continuously data returning (Burst mode)

NOTE

In case of using Burst mode, setting from amplifier unit is not available.

digitalYEWFLO continuously sends the data stored in it when the burst mode it set "ON". Either one of instantaneous flow rate, output in % and current output can be selected and sent. (Note: This mode is preserved after the converter has been turned off.)

The interval of sending data in this mode is the same as the common specification of HART communicator.

*Calling up "Burst option" display.

Online ⇒ 1.Device setup ⇒ 4.Detailed setup
⇒ 3.Output setup ⇒ 6.HART output ⇒ 3.Burst mode
⇒ 1.Burst option

F040606_3.EPS

Multi HHT communication

Corresponding to discriminating communication between two HHTs.

Device ID setting

Device ID is set in an unsigned integer number of 3 bytes.

4.6.8 Data Renewing

There are two methods to load the data of digitalYEWFLO to HART Communicator, periodic data renewing and discretionary data renewing.

(1) Periodic Data Renewing
The following data are renewed in 0.5 to 2 seconds cycle.
PV, PV % rnge, PV AO, Totl

(2) Discretionary Data Renewing
The following data can be loaded from/to digitalYEWFLO. Up load can be done with **SAVE (F2)** on any online menu, and down load can be done on Saved Configuration menu in Offline menu. (Refer to HART Communicator Manual.)

4.6.9 Checking for Problems

The self-diagnostic function digitalYEWFLO is stated at Chapter 6. By using HART Communicator, it is also available to carry out in "Test/Status" parameter. Exam for each error.

*Calling up "Diag/Service" setting display.

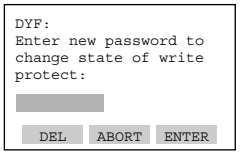
1.Device setup -> 2.Diag/Service

4.6.10 Write Protect

Write protect function is provided to inhibit parameter change. That becomes active by entering a password in “New password”. Write protect status is released for 10 minutes by entering the password in “Enable wrt 10min”.

Setting the Password

HOT KEY ⇒ 2.Wrt protect menu ⇒ 3.New password



The first indication of Wire protect menu is “1.Write protect ⇒ **No**” after password setting, it shows “**Yes**”.
Enter a password into .
Press **ENTER(F4)**.

Enter a password into again.
Press **ENTER(F4)**.
Then, “Change to new password” is indicated.

F040607_1.EPS

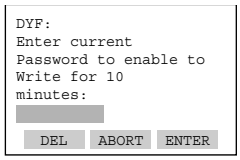
HOT KEY ⇒ 2.Wrt protect menu ⇒ 2.Enable wrt 10min

F040607_2.EPS

“Enable Write” release write protect status for 10 minutes. While write protect status is released, enter a new password in the “New Password”.

It will not be possible to set a new password when 10 minutes have elapsed.

If a parameter, which is able to rewrite, it changed during it is in “Enable wrt 10min”, releasing time is extended for more 10 minutes as of the time.



Enter a password into .
Press **ENTER(F4)**.
Then, “Release the write protection for 10 minutes.” is indicated.

F040607_3.EPS

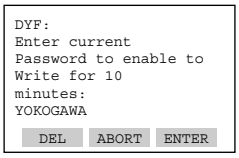
NOTE

- When the write protect function is active (its menu bar shows “Yes”), data setting changes in all parameters of digitalYEWFLO are inhibited and cannot be changed using the HART communicator.
- If 8 characters are input as “space”, the Write protect function is in release status irrespective of time.
- If both digitalYEWFLO and HART Communicator power off and on again within 10 minutes after releasing of write protect status, “Enable Write” becomes unavailable.

Joker Password

The Joker Password is reserved for forgetting the password. Though a password had been already set, the Write protect mode is able to release to inhibit status temporary be entering the Joker Password, “YOKOGAWA”.

HOT KEY ⇒ 2.Wrt protect menu ⇒ 2.Enable wrt 10min

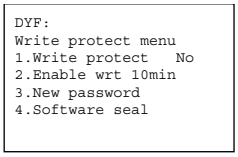


Enter a password into “YOKOGAWA”.
Press **ENTER(F4)**.

F040607_4.EPS

Software seal

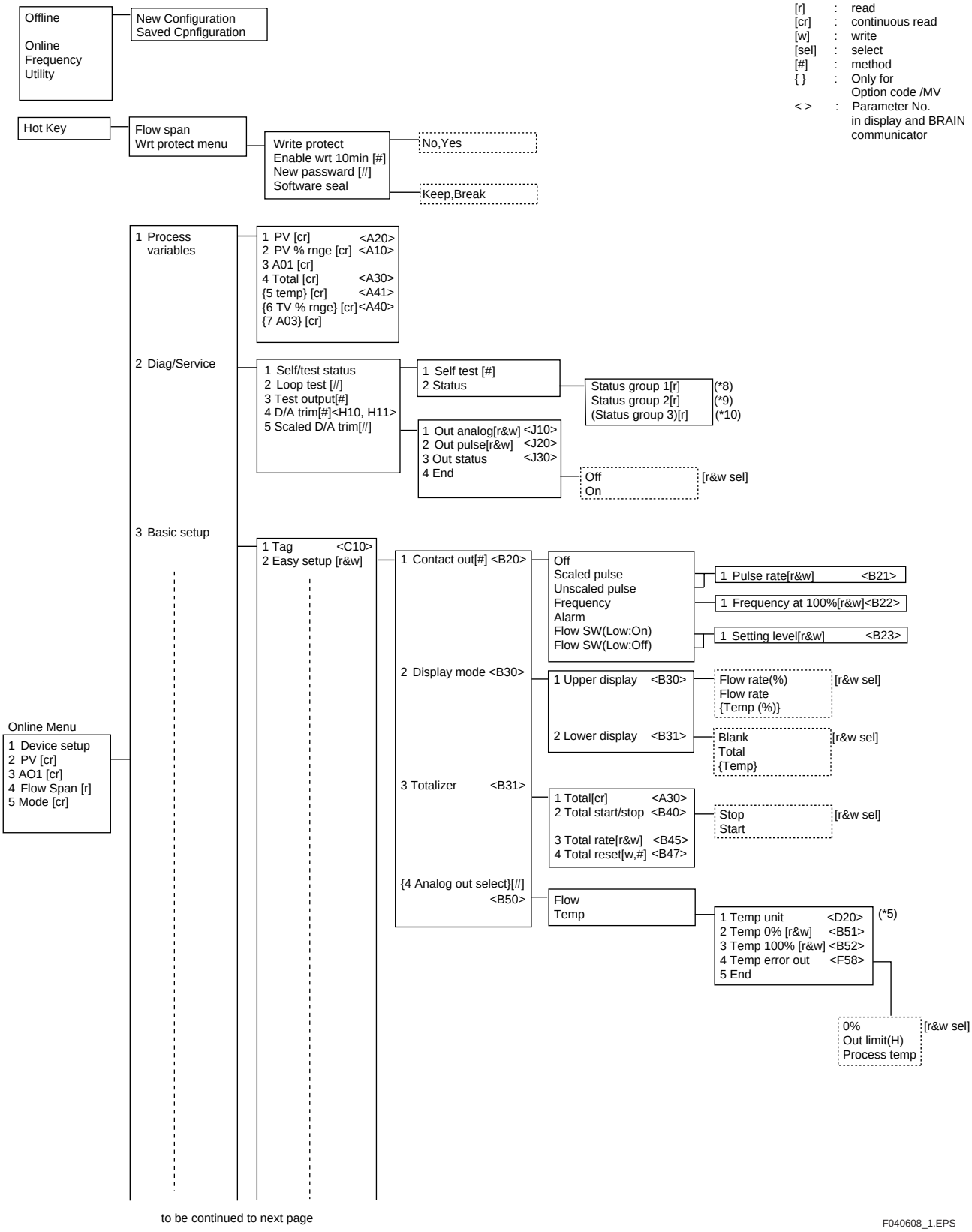
The “Software seal” menu is reserved as a evidence so that user is able to confirm whether the Joker password is used or not. This evidence is saved.



The first indication Software seal manu is “4.Software seal ⇒ keep” after the joker password setting, it shows “Break”.

F040607_5.EPS

4.6.11 Menu Tree



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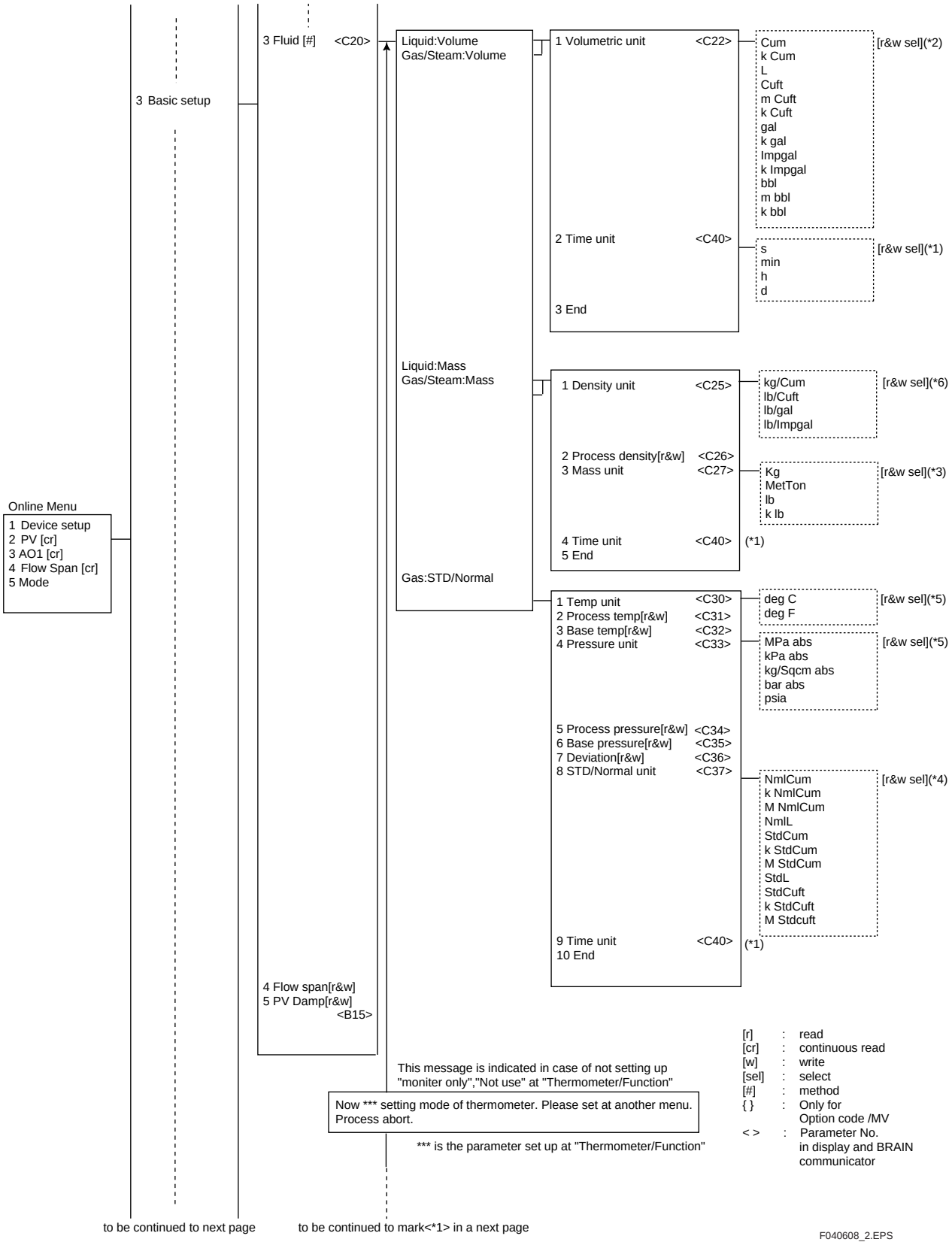
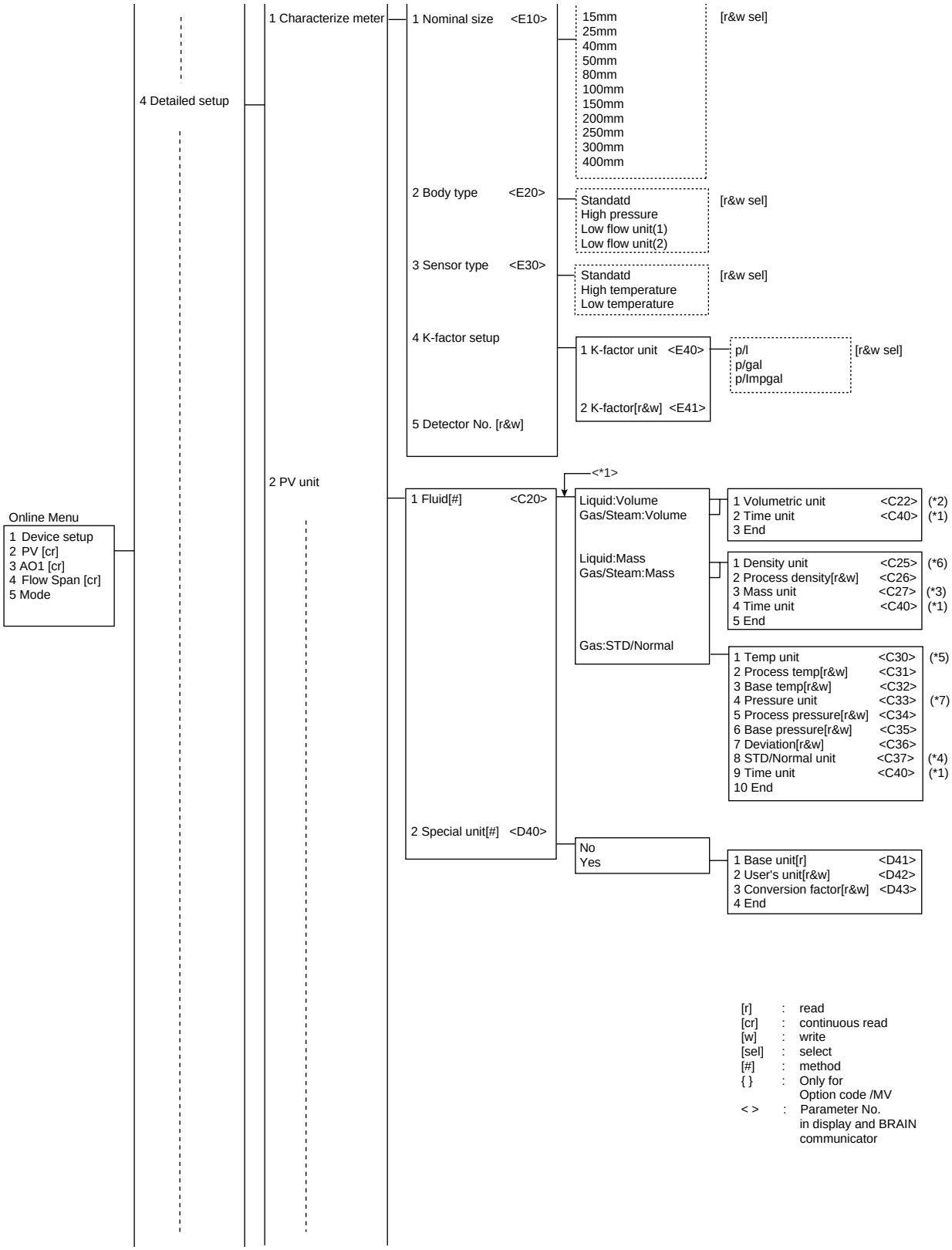
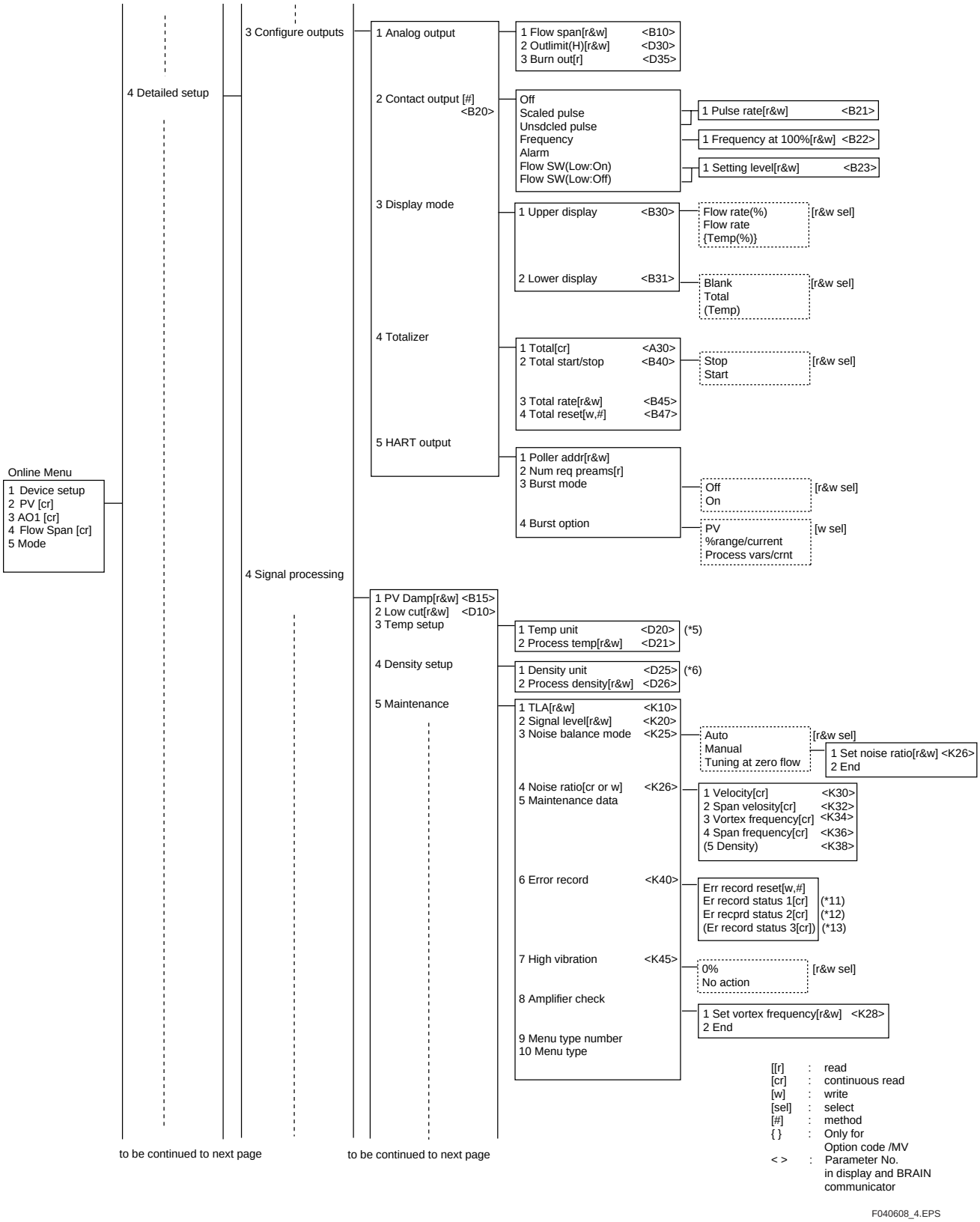
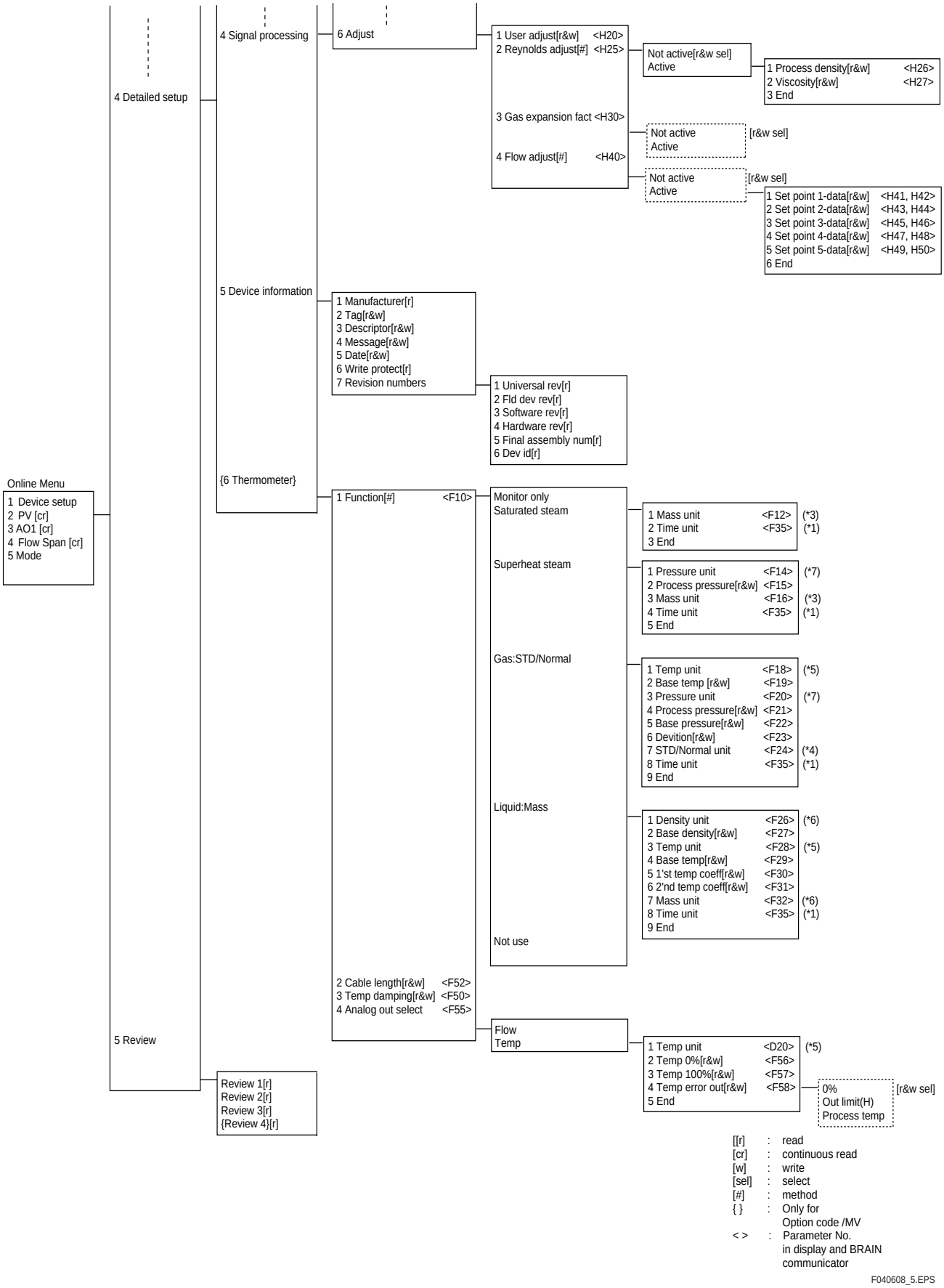
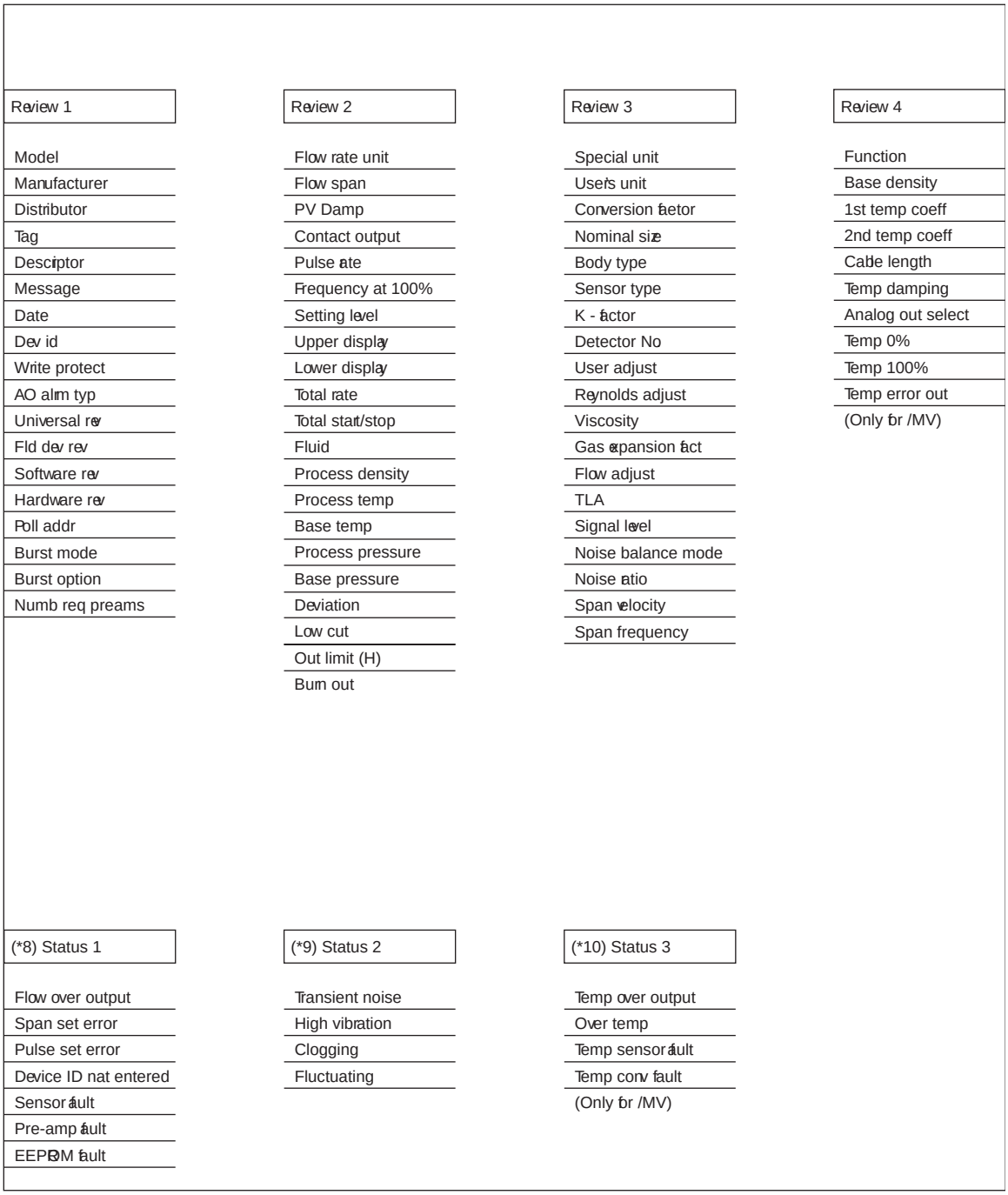
F040608_1.EPS


Online Menu
1 Device setup
2 PV [cr]
3 AO1 [cr]
4 Flow Span [cr]
5 Mode
3 Basic setup
3 Fluid [#] <C20>
Liquid:Volume
Gas/Steam:Volume
1 Volumetric unit <C22>
Cum
k Cum
L
Cuft
m Cuft
k Cuft
gal
k gal
Impgal
k Impgal
bbl
m bbl
k bbl
[r&w sel](*2)
2 Time unit <C40>
s
min
h
d
[r&w sel](*1)
3 End
Liquid:Mass
Gas/Steam:Mass
1 Density unit <C25>
kg/Cum
lb/Cuft
lb/gal
lb/Impgal
[r&w sel](*6)
2 Process density[r&w] <C26>
3 Mass unit <C27>
Kg
MetTon
lb
k lb
[r&w sel](*3)
4 Time unit <C40>
5 End
(*1)
Gas:STD/Normal
1 Temp unit <C30>
2 Process temp[r&w] <C31>
3 Base temp[r&w] <C32>
4 Pressure unit <C33>
deg C
deg F
[r&w sel](*5)
MPa abs
kPa abs
kg/Sqcm abs
bar abs
psia
[r&w sel](*5)
5 Process pressure[r&w] <C34>
6 Base pressure[r&w] <C35>
7 Deviation[r&w] <C36>
8 STD/Normal unit <C37>
NmlCum
k NmlCum
M NmlCum
NmlL
StdCum
k StdCum
M StdCum
StdL
StdCuft
k StdCuft
M Stdcuft
[r&w sel](*4)
9 Time unit <C40>
10 End
(*1)
4 Flow span[r&w]
5 PV Damp[r&w]
<B15>
This message is indicated in case of not setting up "moniter only","Not use" at "Thermometer/Function"
Now *** setting mode of thermometer. Please set at another menu.
Process abort.
*** is the parameter set up at "Thermometer/Function"
[r] : read
[cr] : continuous read
[w] : write
[sel] : select
[#] : method
{ } : Only for Option code /MV
< > : Parameter No. in display and BRAIN communicator
to be continued to next page
to be continued to mark<*1> in a next page
F040608_2.EPS


Online Menu
1 Device setup
2 PV [cr]
3 AO1 [cr]
4 Flow Span [cr]
5 Mode
4 Detailed setup
1 Characterize meter
1 Nominal size <E10>
15mm
25mm
40mm
50mm
80mm
100mm
150mm
200mm
250mm
300mm
400mm
[r&w sel]
2 Body type <E20>
Standatd
High pressure
Low flow unit(1)
Low flow unit(2)
[r&w sel]
3 Sensor type <E30>
Standatd
High temperature
Low temperature
[r&w sel]
4 K-factor setup
1 K-factor unit <E40>
p/l
p/gal
p/Impgal
[r&w sel]
2 K-factor[r&w] <E41>
5 Detector No. [r&w]
2 PV unit
<*1>
1 Fluid[#] <C20>
Liquid:Volume
Gas/Steam:Volume
1 Volumetric unit <C22> (*2)
2 Time unit <C40> (*1)
3 End
Liquid:Mass
Gas/Steam:Mass
1 Density unit <C25> (*6)
2 Process density[r&w] <C26>
3 Mass unit <C27> (*3)
4 Time unit <C40> (*1)
5 End
Gas:STD/Normal
1 Temp unit <C30> (*5)
2 Process temp[r&w] <C31>
3 Base temp[r&w] <C32>
4 Pressure unit <C33> (*7)
5 Process pressure[r&w] <C34>
6 Base pressure[r&w] <C35>
7 Deviation[r&w] <C36>
8 STD/Normal unit <C37> (*4)
9 Time unit <C40> (*1)
10 End
2 Special unit[#] <D40>
No
Yes
1 Base unit[r] <D41>
2 User's unit[r&w] <D42>
3 Conversion factor[r&w] <D43>
4 End
[r] : read
[cr] : continuous read
[w] : write
[sel] : select
[#] : method
{ } : Only for Option code /MV
< > : Parameter No. in display and BRAIN communicator
to be continued to next page
F040608_3.EPS


Online Menu
1 Device setup
2 PV [cr]
3 AO1 [cr]
4 Flow Span [cr]
5 Mode
4 Detailed setup
3 Configure outputs
1 Analog output
1 Flow span[r&w] <B10>
2 Outlimit(H)[r&w] <D30>
3 Burn out[r] <D35>
2 Contact output [#] <B20>
Off
Scaled pulse
Unsdcled pulse
Frequency
Alarm
Flow SW(Low:On)
Flow SW(Low:Off)
1 Pulse rate[r&w] <B21>
1 Frequency at 100%[r&w] <B22>
1 Setting level[r&w] <B23>
3 Display mode
1 Upper display <B30>
Flow rate(%)
Flow rate
{Temp(%)}
[r&w sel]
2 Lower display <B31>
Blank
Total
(Temp)
[r&w sel]
4 Totalizer
1 Total[cr] <A30>
2 Total start/stop <B40>
Stop
Start
[r&w sel]
3 Total rate[r&w] <B45>
4 Total reset[w,#] <B47>
5 HART output
1 Poller addr[r&w]
2 Num req preams[r]
3 Burst mode
Off
On
[r&w sel]
4 Burst option
PV
%range/current
Process vars/crnt
[w sel]
4 Signal processing
1 PV Damp[r&w] <B15>
2 Low cut[r&w] <D10>
3 Temp setup
1 Temp unit <D20>
2 Process temp[r&w] <D21>
(*5)
4 Density setup
1 Density unit <D25>
2 Process density[r&w] <D26>
(*6)
5 Maintenance
1 TLA[r&w] <K10>
2 Signal level[r&w] <K20>
3 Noise balance mode <K25>
Auto
Manual
Tuning at zero flow
[r&w sel]
1 Set noise ratio[r&w] <K26>
2 End
4 Noise ratio[cr or w] <K26>
5 Maintenance data
1 Velocity[cr] <K30>
2 Span velosity[cr] <K32>
3 Vortex frequency[cr] <K34>
4 Span frequency[cr] <K36>
(5 Density) <K38>
6 Error record <K40>
Err record reset[w,#]
Er record status 1[cr] (*11)
Er recprd status 2[cr] (*12)
(Er record status 3[cr]) (*13)
7 High vibration <K45>
0%
No action
[r&w sel]
8 Amplifier check
1 Set vortex frequency[r&w] <K28>
2 End
9 Menu type number
10 Menu type
[[r] : read
[cr] : continuous read
[w] : write
[sel] : select
[#] : method
{ } : Only for Option code /MV
< > : Parameter No. in display and BRAIN communicator
to be continued to next page
to be continued to next page
F040608_4.EPS


Online Menu
1 Device setup
2 PV [cr]
3 AO1 [cr]
4 Flow Span [cr]
5 Mode
4 Detailed setup
5 Review
4 Signal processing
6 Adjust
1 User adjust[r&w] <H20>
2 Reynolds adjust[#] <H25>
Not active[r&w sel]
Active
1 Process density[r&w] <H26>
2 Viscosity[r&w] <H27>
3 End
3 Gas expansion fact <H30>
Not active
Active
[r&w sel]
4 Flow adjust[#] <H40>
Not active
Active
[r&w sel]
1 Set point 1-data[r&w] <H41, H42>
2 Set point 2-data[r&w] <H43, H44>
3 Set point 3-data[r&w] <H45, H46>
4 Set point 4-data[r&w] <H47, H48>
5 Set point 5-data[r&w] <H49, H50>
6 End
5 Device information
1 Manufacturer[r]
2 Tag[r&w]
3 Descriptor[r&w]
4 Message[r&w]
5 Date[r&w]
6 Write protect[r]
7 Revision numbers
1 Universal rev[r]
2 Fld dev rev[r]
3 Software rev[r]
4 Hardware rev[r]
5 Final assembly num[r]
6 Dev id[r]
{6 Thermometer}
1 Function[#] <F10>
Monitor only
Saturated steam
1 Mass unit <F12> (*3)
2 Time unit <F35> (*1)
3 End
Superheat steam
1 Pressure unit <F14> (*7)
2 Process pressure[r&w] <F15>
3 Mass unit <F16> (*3)
4 Time unit <F35> (*1)
5 End
Gas:STD/Normal
1 Temp unit <F18> (*5)
2 Base temp [r&w] <F19>
3 Pressure unit <F20> (*7)
4 Process pressure[r&w] <F21>
5 Base pressure[r&w] <F22>
6 Devition[r&w] <F23>
7 STD/Normal unit <F24> (*4)
8 Time unit <F35> (*1)
9 End
Liquid:Mass
1 Density unit <F26> (*6)
2 Base density[r&w] <F27>
3 Temp unit <F28> (*5)
4 Base temp[r&w] <F29>
5 1'st temp coeff[r&w] <F30>
6 2'nd temp coeff[r&w] <F31>
7 Mass unit <F32> (*6)
8 Time unit <F35> (*1)
9 End
Not use
2 Cable length[r&w] <F52>
3 Temp damping[r&w] <F50>
4 Analog out select <F55>
Flow
Temp
1 Temp unit <D20> (*5)
2 Temp 0%[r&w] <F56>
3 Temp 100%[r&w] <F57>
4 Temp error out[r&w] <F58>
5 End
0%
Out limit(H)
Process temp
[r&w sel]
Review 1[r]
Review 2[r]
Review 3[r]
{Review 4}[r]
[[r] : read
[cr] : continuous read
[w] : write
[sel] : select
[#] : method
{ } : Only for Option code /MV
< > : Parameter No. in display and BRAIN communicator
F040608_5.EPS



F040608_6.EPS

5. Parameter Setup

5.1 Parameter Setup

The parameters are set before factory shipment. Set the required parameter of changing fluid, contact out and indication of display.

5.2 Multi-Variable Type Parameter (Only for /MV)

Parameter item F is indicated when /MV is selected.

The parameters are set before factory shipment, but it is necessary to set the analog output of temperature, span of temperature output.

IMPORTANT

For the remote type, be sure to set the cable length (F52) for DYA, remote type converter, because of effect of the cable length.

5.3 Parameters List

This section describes the parameter of digitalYEWFLO.

• Contents of parameter lists.

Item	Description
Parameter number	Parameter item number.
Name	Parameter name.
R/ W (Read and write)	Indicates parameter attributes. R: Display only (writing is not permitted). W : Writing is permitted.
Data range	Shows data setting ranges for numerical value entry. Shows data to be selected for data selection. ( ) in parentheses, data code is shown for the display.
Unit	Engineering unit.
Remarks	Remarks such as a description of the contents are given.
Disp.	D : Display can set parameter.
U / D	L : Parameter can be set by UP LOAD and DOWN LOAD. (Check all parameters after setting by DOWN LOAD.)
Initial value	Indicates the initial set values.

T050301.EPS

(1) Item A : Indication

These items are for the indication of flowrate and total.

Item	Name	R / W	Data Range	Unit	Remark	Initial value	Disp.	U / D
A00	DISPLAY				Menu A (Display)			
A10	FLOW RATE(%)	R	0.0 to 110.0	%	Flow rate			
A20	FLOW RATE	R	0.0 to 65535	FU+C40	Flow rate (in engineering unit)			
A30	TOTAL	R	0 to 999999	FU	Totalized value			
	(Indicate only within Temperature sensor)							
A40	TEMP(%)(*1)	R	0.0 to 110.0	%	Temperature Values (%)			
	(Indicate only for Temperature sensor)							
A41	TEMPERATURE(*1)	R	–999.9 to 999.9	D20	Temperature Values			
A60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			

FU : Flow unit
(*1): Only for Option Code /MV

T050302.EPS

(2) Item B : Easy Setting

These items are for the principal items to operate digitalYEWFLO.
A value in "( )" is the data corresponding to the indicator.

Item	Name	R / W	Data Range	Unit	Remark	Initial value	Disp.	U / D
B00	EASY SETUP				Menu B			
B10	FLOW SPAN	W	0.00001 to 32000	FU+C40	Flow Span	10	D	L
B15	DAMPING	W	0 to 99	sec	Damping Time	4	D	L
B20	CONTACT OUT	W	OFF (0) SCALED PULSE (1) UNSCALED PULSE (2) FREQUENCY (3) ALARM (4) FLOW SW(LOW:ON) (5) FLOW SW(LOW:OFF) (6)		Contact Output Type	(0)	D	L
	(Indicate and Set only for B20 : SCALED PULSE, UNSCALED PULSE)							
B21	PULSE RATE	W	0.00001 to 32000	FU / P	Pulse Output Rate	1.0	D	L
	(Indicate and Set only for B20 :FREQUENCY)							
B22	FREQ AT 100%	W	0 to 10000	PPS	Pulse Output Rate at sec / 100%	1000	D	L
	(Indicate and Set only for B20 :FLOW SW (ON), FLOW SW (OFF))							
B23	SET LEVEL	W	0.00001 to 32000	FU +C40	Flow Switch (Actual Flow rate)	0	D	L
B30	UPPER DISP	W	FLOW RATE (%) (0) FLOW RATE (1) TEMP(%)(*1)	FU / P	Selection of Upper Display	(0)	D	L
B31	LOWER DISP	W	BLANK (0) TOTAL (1) TEMP(*1)		Selection of Lower Display	(0)	D	L
B40	TOTAL START	W	STOP (0) START (1)		Start / Stop of Totalizer	(0)	D	L
B45	TOTAL RATE	W	0.00001 to 32000 (0)		Total Rate	1.0	D	L
B47	TOTAL RESET	W	NOT EXECUTE (0) EXECUTE (1)		Totalizer Reset	(0)	D	L
	(Indicate and Set only for Option code /MV)							
B50	A / OUT SELECT	W	FLOW (0) TEMP (1)		Selection of Analog Output	0	D	L
	(Indicate and Set only for B50: TEMP)							
B51	TEMP 0%	W	-999.9 to 999.9	D20	Set Temperature Value at 0%	-40	D	L
B52	TEMP 100%	W	-999.9 to 999.9	D20	Set Temperature Value at 100%	260	D	L
B60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			

FU : Flow unit
(*1) : Only for Option Code /MV

T050303.EPS

(3) Item C : BASIC SETUP

These items are for the basic parameters with setting before shipment.
The parameters, C20 to C50, are not indicated when option code "/MV" is selected and parameter item is selected in F10 except "Monitor only" or "Not use".

A value in"( )" is the data corresponding to the indicator.

Item	Name	R/W	Data Range	Unit	Remark	Initial value	Disp.	U/D
C00	BASIC SETUP				Menu C (Meter characterize)			
C10	TAG NO.	W	16 characters		Tag Number			
C20	FLUID	W	LIQUID:Volume (0) GAS/STEAM:Volume (1) LIQUID:Mass (2) GAS/STEAM:Mass (3) GAS:STD/Normal (4)		Selection of FLUID type	(0)	D	L
	(Indicate and Set only for C20 : LIQUID : Volume, GAS / STEAM : Volume)							
C22	VOLUME UNIT	W	m^3 (0) k m^3 (1) l (2) cf (3) m cf (4) k cf (5) USgal (6) k USgal (7) UKgal (8) k UKgal (9) bbl (10) m bbl (11) k bbl (12)		Selection of Flow Units for Flow Rate	(0)	D	L
	(Indicate and Set only for C20 : LIQUID : MASS, GAS / STEAM : MASS)							
C25	DENSITY UNIT	W	kg/m^3 (0) lb/c f (1) lb/USgal (2) lb/UKgal (3)	C25	Selection of Density Unit	(0)	D	L
C26	DENSITY f	W	0.00001 to 32000		Operating Density (Manual Setting Value)	1024	D	L
C27	MASS UNIT	W	kg (0) t (1) lb (2) k lb (3)		Selection of Mass Flow Unit	(0)	D	L
	(Indicate and Set only for C20 : GAS : STD / Normal)							
C30	TEMP UNIT	W	deg C (0) deg F (1)	C30	Selection of Temperature Unit	(0)	D	L
C31	TEMP f	W	-999.9 to 999.9	C30	Operating Temperature (Manual Setting Value)	15.0	D	L
C32	TEMP b	W	-999.9 to 999.9		Standard / Normal Temperature	15.0	D	L
C33	PRESS UNIT	W	MPa abs (0) kPa abs (1) bar abs (2) kg/cm^2 a (3) psia (4)	C33	Selection of Pressure Unit	(0)	D	L
C34	PRESS f	W	0.00001 to 32000	C33	Absolute Pressure at Operating Condition (Manual Setting Value)	0.1013	D	L
C35	PRESS b	W	0.00001 to 32000		Absolute Pressure at Standard Condition	0.1013	D	L
C36	DEVIATION	W	0.001 to 10.0		Deviation Factor	1.0	D	L
C37	STD/NOR UNIT	W	Nm^3 (0) k Nm^3 (1) M Nm^3 (2) Nl (3) Sm^3 (4) k Sm^3 (5) M Sm^3 (6) Sl (7) scf (8) k scf (9) M scf (10)		Selection of Volumetric Unit at Normal Condition	(0)	D	L
C40	TIME UNIT	W	/s (0) /m (1) /h (2) /d (3)		Selection of Time Unit	(2)	D	L
C45	FLOW SPAN	W	0.00001 to 32000	FU+C40	Flow Span	10	D	L
C50	DAMPING	W	0 to 99	sec	Damping Time	4	D	L
C60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			

FU : Flow unit
(*1) : Only for Option Code /MV

T050304.EPS

(4) Item D : Additional Setup

These items are for Auxiliary Setup.

A value in "( )" is the data corresponding to the indicator.

Item	Name	R / W	Data Range	Unit	Remark	Initial value	Disp.	U / D
D00	AUX. SETUP				Menu D (Additinal Setup)			
D10	LOW CUT	W	* to 32000	FU+C40	Low Cut Flow rate *Minimum Flow rate / 2		D	
D20	TEMP UNIT	W	deg C (0)		Selection of Temperature Unit	(0)	D	L
			deg F (1)					
D21	TEMP f	W	-999.9 to 999.9	D20	Operating Temperature (Manual Setting Value)	15.0	D	L
D25	DENSITY UNIT	W	kg/m^3 (0)		Selection of Density Unit	(0)	D	L
			lb/cf (1)					
			lb/USgal (2)					
			lb/UKgal (3)					
D26	DENSITY f	W	0.00001 to 32000	D25	Operating Density (Manual Setting Value)	1024	D	L
D30	OUT LIMIT (H)	W	100.0 to 110.0	%	Upper Limit Value	110.0	D	L
D35	BURN OUT	R	High (0)		Output Direction at Burn Out	(0)	D	L
			Low (1)					
D40	SPECIAL UNIT		No (0)		Selection of change for Special Flow Unit	(0)	D	L
			Yes (1)					
(Indication and set only for D40 : Yes)								
D41	BASE UNIT	R	m^3 (0)		Basic unit for conversion to special unit		D	
			k m^3 (1)					
			l (2)					
			cf (3)					
			m cf (4)					
			k cf (5)					
			USgal (6)					
			kUSgal (7)					
			UKgal (8)					
			kUKgal (9)					
			bbl (10)					
			m bbl (11)					
			k bbl (12)					
			kg (13)					
			t (14)					
			lb (15)					
			k lb (16)					
			Nm^3 (17)					
			k Nm^3 (18)					
			M Nm^3 (19)					
			NI (20)					
			Sm^3 (21)					
			k Sm^3 (22)					
			M Sm^3 (23)					
			SI (24)					
			scf (25)					
			k scf (26)					
			M scf (27)					
D42	USER'S UNIT	W	8 characters		User's unit			L
D43	CONV FACTOR	W	0.00001 to 32000		Coefficient for conversion to special unit	1.0	D	
D60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			L

FU : Flow unit

T050305.EPS

(5) Item E : Detector Setup

These items are for detector that has been already set before.

A value in "( )" is the data corresponding to the indicator.

Item	Name	R/W	Data Range	Unit	Remark	Initial value	Disp.	U/D
E00	METER SETUP				Menu E (Detector setup)			
E10	NOMINAL SIZE	W	15mm (0) 25mm (1) 40mm (2) 50mm (3) 80mm (4) 100mm (5) 150mm (6) 200mm (7) 250mm (8) 300mm (9) —— (10)		Selection of Nominal Size	(1)	D	L
E20	BODY TYPE	W	Standard (0) High Pressure (1) Low Flow Unit (1) (2) Low Flow Unit (2) (3) Reduced Bore Type (/R1)(4) Reduced Bore Type (/R2)(5)		Selection of Body Type	(0)	D	L
E30	SENSOR TYPE	W	Standard (0) High Temperature (1) Low Temperature (2)		Selection of Sensor Type	(0)	D	L
E40	K-FACT UNIT	W	P/l (0) P/Usgal (1) P/Ukgal (2)	E40	Selection of K-factor Unit	(0)	D	L
E41	K-FACTOR	W	0.00001 to 32000		K-factor value of 15 deg C	68.6	D	
E50	DETECTOR No.	W	16 characters		Detector number			
E60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			

FU : Flow unit

T050306.EPS

(6) Item F: Thermometer (Only for Option Code /MV)

These items is for thermometer setting when.

A Value in "( )" is the data corresponding to the indicator.

F00	THERMOMETER				Menu F(Thermometer) Only within Thermometer	Initial Value	Disp	U/D*1
F10	Function	W	Monitor only (0)		Select thermometer function.	(0)	D	L
			Saturated Steam (1)		(Move to F40 when "Monitor only" is selected)			
			Superheat Steam (2)		(Move to F60 when "Not Use" is selected)			
			GAS: STD/Normal (3)					
			LIQUID: Mass (4)					
			Not use (5)					
	(Indicate and set only for F10: Saturated Stem)							
F12	MASS UNIT	W	kg (0)		Selection of mass flow rate unit	(0)	D	L
			t (1)					
			lb (2)					
			k lb (3)					
	(Indicate and set only for F10: Superheat Steam)							
F14	PRSS UNIT	W	MPa abs (0)		Selection of pressure unit	(0)	D	L
			kPa abs (1)					
			bar abs (2)					
			kg/cm2 a (3)					
			psia (4)					
F15	PRESS f	W	0.00001 to 32000	F14	Absolute pressure at operating condition(Manual setting vaiue)	0.1013		
F16	MASS UNIT	W	kg (0)		Selection of mass flow rate unit	(0)	D	L
			t (1)					
			lb (2)					
			k lb (3)					
	(Indicate and set only for F10: GAS STD/Normal)							
F18	TEMP UNIT	W	deg C (0)		Selection of temperature unit	(0)	D	L
			deg F (1)					
F19	TEMP b	W	-999.9 to 999.9	F18	Standard/Normal temperature	15.0	D	L
F20	PRESS UNIT	W	MPa abs (0)		Selection of temperture unit	(0)	D	L
		W	kPa abs (1)					
		W	bar abs (2)					
		W	kg/cm2 a (3)					
		W	psia (4)					
F21	PRESS f	W	0.00001 to 32000	F20	Absolute pressure at operating condition(Manual setting value)	0.1013	D	L
F22	PRESS b	W	0.00001 to 32000	F20	Absolute pressure at Standard condition	0.1013	D	L
F23	DEVIATION	W	0.001 to 10.000		Deviation factor	1.0	D	L
F24	STD/NOR UNIT	W	Nm3 (0)		Selection of volumetric unit at normal condition	(0)	D	L
			k Nm3 (1)					
			M Nm3 (2)					
			Nl (3)					
			Sm3 (4)					
			k Sm3 (5)					
			M Sm3 (6)					
			Sl (7)					
			scf (8)					
			k scf (9)					
			M scf (10)					
	(Indicate and set only for F10: Liquid: Mass)							
F26	DENSITY UNIT	W	kg/m3 (0)		Selection of density unit	0	D	L
			lb/cf (1)					
			lb/USgal (2)					
			lb/UKgal (3)					
F27	DENSITY b	W	0.00001 to 32000	F26	Density of standard condition	1024	D	L
F28	TEMP UNIT	W	deg C (0)		Selection of temperature unit	0	D	L
			deg F (1)					
F29	TEMP b	W	-999.9 to 999.9	F28	Temperature of standard condition	15.0	D	L
F30	1st coef	W	-32000 to 32000	1/F28	1st temperature coefficient	0	D	L
F31	2nd coef	W	-32000 to 32000	1/F28^2	2nd temperature coefficient	0	D	L
F32	MASS UNIT	W	kg (0)		Selection of mass flow rate unit	(0)	D	L
			t (1)					
			lb (2)					
			k lb (3)					
F35	TIME UNIT	W	/s (0)		Selection of time unit	1	D	L
			/m (1)					
			/h (2)					
			/d (3)					
F40	FLOW SPAN	W	0.00001 to 32000	FU+35	Flow span	0.5	D	L
F45	DAMPING	W	0 to 99	sec	Damping	4	D	L
F50	TEMP DAMPING	W	0 to 99	sec	Damping for temperture output	4	D	L
F52	CABLE LENGTH	W	0 to 30	m	Cable length for signal cable (0m in case of integral version)	0	D	L
F55	A/OUT SELECT	W	FLOW (0)		Selection of analog output	0	D	L
			TEMP (1)					
	(Indicate and set only for F55: TEMP)							
F56	TEMP 0%	W	-999.9 to 999.9	D20	Temperture value at 0%	-40	D	L
F57	TEMP 100%	W	-999.9 to 999.9	D20	Temperture value at 100%	260	D	L
F58	TEMP ERR OUT	W	0% (0)		Selection of themometer error output when "F55: TEMP"	1	D	L
			OUT LIMIT(H) (1)		is selected (A value of OUT LIMIT(H) depend on D30)			
			TEMP f (2)					
F60	SELF CHECK	R	GOOD		Self-diagnostic message			
			ERROR					

(*1) When "K50 : SOFTWARE REV" is "3.10", it can be available.

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(7) Item H : Adjust.

These items are for setting of adjustment.

A value in "( )" is the data corresponding to the indicator.

Item	Name	R / W	Data Range	Unit	Remark	Initial value	Disp.	U / D
H00	ADJUST				Menu H (Adjust)			
H10	TRIM 4mA	W	-1.00 to 1.00	%	Trimming 4mA	0.0	D	
H11	TRIM 20mA	W	-1.00 to 1.00	%	Trimming 20mA	0.0	D	
H20	USER ADJUST	W	0.00001 to 32000		User Adjust	1.0	D	
H25	REYNOLDS ADJ	W	NOT ACTIVE (0) ACTIVE (1)		Reynolds Coefficient	(0)	D	
(Indicator and Set only H25 : Active)								
H26	DENSITY f	W	0.00001 to 32000	D25	Density at operating condition	1024	D	
H27	VISCOSITY	W	0.00001 to 32000	mPa·s	Viscosity factor	1.0	D	
H30	EXPANSION FA	W	NOT ACTIVE (0) ACTIVE (1)		Expansion correction for compressible Gas	(0)	D	
H40	FLOW ADJUST	W	NOT ACTIVE (0) ACTIVE (1)		Instrumental Error Adjust	(0)	D	
(Indicator and Set only H40 : Active)								
H41	FREQUENCY 1	W	0 to 32000	Hz	First break-point frequency (f1)	0.0	D	
H42	DATA 1	W	-50.00 to 50.00	%	First correcting value (d1)	0.0	D	
H43	FREQUENCY 2	W	0 to 32000	Hz	Second break-point frequency (f2)	0.0	D	
H44	DATA 2	W	-50.00 to 50.00	%	Second correcting value (d2)	0.0	D	
H45	FREQUENCY 3	W	0 to 32000	Hz	Third break-point frequency (f3)	0.0	D	
H46	DATA 3	W	-50.00 to 50.00	%	Third correcting value (d3)	0.0	D	
H47	FREQUENCY 4	W	0 to 32000	Hz	Fourth break-point frequency (f4)	0.0	D	
H48	DATA 4	W	-50.00 to 50.00	%	Fourth correcting value (d4)	0.0	D	
H49	FREQUENCY 5	W	0 to 32000	Hz	Fifth break-point frequency (f5)	0.0	D	
H50	DATA 5	W	-50.00 to 50.00	%	Fifth correcting value (d5)	0.0	D	
H60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			

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(8) Item J : Test

These items are for test of output.

A value in "( )" is the data corresponding to the indicator.

Item	Name	R / W	Data Range	Unit	Remark	Initial value	Disp.	U / D
J00	TEST				Menu J (Test)			
J10	OUT ANALOG	W	0.0 to 110.0	%	Current Output	0.0	D	
J20	OUT PULSE	W	0 to 10000	PPS	Pulse Output	0	D	
J30	OUT STATUS	W	OFF (0) ON (1)		Status Output	(0)	D	
J60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			

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(9) Item K : Maintenance

These items are for maintenance.

Item	Name	R / W	Data Range	Unit	Remark	Initial value	Disp.	U / D
K00	MAINTENANCE				Menu K (Maintenance)			
K10	TLA	W	0.1 to 20.0		Trigger Level Adjust	1.0	D	
K20	SIGNAL LEVEL	W	0.1 to 20.0		Signal Level	1.0	D	
K25	N.B. MODE	W	AUTO (0) MANUAL (1) TUNING AT ZERO (2)		Selection of Noise balance Mode	(0)	D	
K26	NOISE RATIO	R / W	0.00 to 2.00				D	
K28	SET VORTEX F	W	0 to 10000	Hz	Output test by setting simulated frequency (*2)		D	
K30	VELOCITY	R		m/s	Velocity		D	
K32	SPAN V	R		m/s	Span velocity		D	
K34	VORTEX FREQ.	R		Hz	Vortex frequency		D	
K36	SPAN F	R		Hz	Span frequency		D	
	(Indicate only for F10: "Saturated Steam" or "Super heat steam" or "Liquid mass)(*1)							
K38	DENSITY	R	0.00001 to 32000	D25	Density value (Calculated by Thermometer)		D	
K40	ERROR RECORD	R			Error Records			
K45	H VIBRATION	W	0% No ACTION		Selection of Output Function when "High Vibration" error is indicated.			
K50	SOFTWARE REV	R	0.01 to 99.99		Software Revision Number			
K60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			

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(*1) Only for Option Code /MV

(*2) Available for 5.10 or greater version that can be checked in K50 SOFTWARE REV.

(10) Item M : Memo

These items are for Memorandum.

Item	Name	R / W	Data Range	Unit	Remark	Initial value	Disp.	U / D
M00	MEMO				Menu M (Memo)			
M10	MEMO 1	W	16 characters		Memorandum 1 (16 characters)			
M20	MEMO 2	W	16 characters		Memorandum 2 (16 characters)			
M30	MEMO 3	W	16 characters		Memorandum 3 (16 characters)			
M60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			

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5.4 Parameter Description

(1) Item A : Display

These items are for the indication of flowrate and total.

[A10:FLOW RATE(%)] Flow rate

Flowrate is displayed by "%" to span value.

[A20:FLOW RATE] Flow rate (Engineering unit)

Flowrate is displayed by engineering unit.

[A30:TOTAL] Total value

Total value of flowrate is displayed

The following item should be done in case of which Option code /MV is selected and analog output is "Temperature".

[A40:TEMP(%)] Temperature value

The measured temperature value is displayed by "%" to span value of temperature.

The following item should be done in case of which Option code /MV is selected.

[A41:TEMPERATURE] Temperature value

The measured temperature value is displayed by engineering unit.

(2) Item B : Easy Setting

These items are for the Principal items to operate digitalYEWFLO.

A value in "( )" is the data corresponding to indicator.

[B10:FLOW SPAN] Flowrate span

Set the required span with a numerical.

[B15:DAMPING] Damping time constant

Set damping time constant values from 0s to 99sec.

[B20:CONTACT OUT] Contact output

Select contact output.

Item		Description
OFF	(0)	————
SCALED PULSE	(1)	Scaled pulse output: Refer to "B21"
UNSCALED PULSE	(2)	Unscaled pulse output: Refer to "B21"
FREQUENCY	(3)	Frequency output: Refer to "B22"
ALARM	(4)	Alarm output: The status goes from close to open (OFF) during alarming. Refer to 5.5 Error Code Lists.
FLOW SW(LOW:ON)	(5)	Status output: Refer to "B23"
FLOW SW(LOW:OFF)	(6)	Status output: Refer to "B23"

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[B21:PULSE RATE] Pulse output rate

Set output rate in a selection of SCALED PULSE or UNSCALED PULSE.

SCALED PULSE OUTPUT:

When SCALED PULSE is selected in B20, set flowrate per one pulse output. Rate unit is linking to the flow unit.

UNSCALED PULSE OUTPUT:

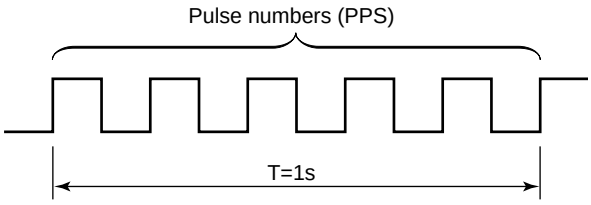
When UNSCALED PULSE is selected in B20, it output number of vortex (vortex frequency) as a pulse-number, which is detected from vortex shedder bar. (1.0 must be set for this.)

The formula for output pulse number is as follows.

Output pulse number per one second = vortex number per one second / PULSE RATE set number. Refer to 6.1.5 Unit of Pulse Output (Scaling).

[B22:100% FREQ] Pulse numbers of 100% at one second

Set pulse number at 100% for one second when "FREQUENCY" in B20 is selected.



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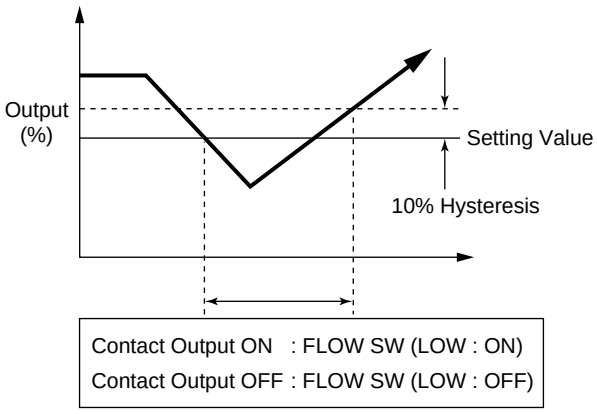
[B23:SET LEVEL] Level of flow switch

Set level of flow switch when "FLOW SW" in B20 is selected. The contact output is sent out when the flowrate is less than the set comparison level.



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[B30:UPPER DISP] Upper indicator display

Select upper display, Flow rate (%) (0), Flowrate (1), TEMP(%)(2). "TEMP(%)" can be selected when Option Code
/MV.

[B31:LOWER DISP] Lower indicator display

Select lower indicator display, "BLANK (0), TOTAL (1), TEMP(2). When "BLANK" in B31 is selected, indicator is blank. "TEMP" can be selected when Option Code
/MV.

[B40:TOTAL START]

Select the START/STOP of totalizer from "STOP (0), START (1)."

[B45:TOTAL RATE] Total rate of the totalizer

Set the total rate of the totalizer.

[B47:TOTAL RESET] Reset the totalizer

When totalizer reset function is executed, the total display and communication parameter are reset.

The following items should be done in case of which Option code "/MV" is selected.

[B50 A/OUT SELECT] Analog Output select

Select the analog output select from flow rate or temperature.

When changing the analog output, UPPER DISPLAY can be changed shown as below automatically.

B50 : A/OUT SELECT	UPPER DISPLAY
"TEMP" TO "FLOW"	FLOW(%)
"FLOW" TO "TEMP"	TEMP(%)

("B30 : UPPER DISPLAY" is "FLOW RATE", it can not be changed.)

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The following item should be done in case of which B50 is "TEMP"

[B51 TEMP 0%]

Set temperature value of 0% output.

[B52 TEMP 100%]

Set temperature valve of 100% output.

(3) Item C : BASIC SETUP

These items are for the basic parameters with setting before shipment.

The parameters which are set in B are not necessary to set in C.

A value in "( )" is the data corresponding to indicator.

The parameters, C20 to C50, are not indicated when option code "/MV" is selected and parameter item is selected in F10 except "Monitor only" or "Not Use".

[C10: TAG NO] Tag. No

Set Tag. No. (16 characters)

Available characters are as follows.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z a b c d e f g h i j k l m n o p q r s t u v w x y z 0 1 2 3 4 5 6 7 8 9 . SPACE / - , + *) (' & % $ # " !

[C20:FLUID] Flowrate unit

Set the flowrate unit below.

Item	Description
LIQUID : Volume (0)	Volumetric flow of liquid measuring
GAS/STEAM : Volume (1)	Volumetric flow of gas or steam measuring
LIQUID : Mass (2)	Mass flow of liquid measuring
GAS/STEAM : Mass (3)	Mass flow of gas or steam measuring
GAS : STD/Normal (4)	Volumetric flow at Standard condition

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The following items should be done in case of which "C20" is "LIQUID : Volume" or "GAS/STEAM : Volume".

[C22:VOLUME UNIT] Volumetric unit

Select the unit of volumetric flow from m^3(0), km^3(1), l(2), cf(3), mcf(4), def(5), USgal(6), kUKgal(9), bbl(10), mbbl(11), kbbl(12).

The following items should be done in case of which "C20" is "LIQUID: Mass" or "GAS/STEAM : Mass"

[C25:DENSITY UNIT] Density Unit of Flow measurement

Select the unit of density from kg/m^3(0), lb(1), lb/USgal(2), lb/UKgal(3).

[C26:DENSITY f] Density at normal operation conditions

Set the density value of the fluid at operating condition for mass flow unit.

[C27:MASS UNIT] Mass flowrate unit

Select the mass flowrate unit from kg(0), t(1), lb(2), k lb(3).

The following item should be done in case of which "C20" is "GAS/STEAM : Volume".

[C30:TEMP UNIT] Fluid temperature unit at operating conditions

Select temperature unit at operating condition from

"degC (0), degF (1)".

[C31:TEMP f] Fluid temperature at operating conditions

Set fluid temperature at operating condition.

Range is -196 to 450°C

The following items should be done in case of which "C20" is "GAS/STD : Normal".

[C32:TEMP b] Fluid temperature at standard/normal conditions

Set the values of Fluid temperature at standard condition.

[C33:PRESS UNIT] Pressure unit

Select the unit of pressure from "MPa abs(0), kPa abs(1), kg/cm2 abs(2), bar abs(3)".

[C34:PRESS f] Absolute pressure at operating conditions

Set the absolute pressure at operating condition.

[C35:PRESS b] Absolute pressure at standard/normal condition

Set the absolute pressure at normal condition.

[C36:DEVIATION] Deviation factor

Set deviation factor.

[C37:STD/NOR UNIT] Volumetric unit at normal conditions

Select volumetric unit at normal condition from Nm^3(0), kNm^3(1), MNm^3(2), Nl(3), Sm^3(4), Km^3(5), Mm^3(6), Sl(7), scf(8), kscf(9), Mscf(10).

[C40:TIME UNIT] TIME UNIT

Select time unit from "/s(0), /m(1), /h(2), d(3)"

[C45:FLOW SPAN] Flowrate span

Set the required span with a numerical value.

[C50:DAMPING] Damping time constant

Set damping time constant values from 0 to 99sec.

(4) Item D (AUX SETUP)

These items are for Auxiliary setup.

A value in "( )" is the data corresponding to indicator.

[D10:LOW CUT] Low-cut flowrate

NOTE

For D10 setting, be sure to set "NOMINAL SIZE" in E10 firstly.

Set to noise elimination or zero flow in the low flowrate (or low frequency) range. The settable range for low cut flowrate is more than half-minimum flowrate.

NOTE

D10: LOW CUT can be set after the items for compensations (H25, H30, H40) are set to "ACTIVE".

[D20:TEMP UNIT] Fluid temperature unit at operating conditions

Select temperature unit at operating condition from "degC (0), degF (1)".

[D21:TEMP f] Fluid temperature at operating conditions

Set fluid temperature at operating condition.

Range is -196 to 450°C

[D25:DENSITY UNIT] Density Unit of Flow measurement

Select the unit of density from kg/m^3(0), lb(1), lb/USgal(2), lb/UKgal(3).

[D26:DENSITY f] Density at normal operation conditions

Set the density value of the fluid at operating condition for mass flow unit

[D30:OUT LIMIT] Limit value of output and indication

Set limit value of output from 100.0% to 110.0%

[D35:BURN OUT] Indication of the output direction at burn out

This is indication of the output direction at burn out. Refer to "6.1.6 Burn out" when the output direction can be changed.

[D40:SPECIAL UNIT] Change to special flowrate unit

Select the availability of changing to special flowrate Unit from "No(0)" or "Yes(1)"

[D41:BASE UNIT] Indication of the special flowrate unit

Indication of the basic flowrate unit when item D40 is "Yes(1)"

[D42:USER'S UNIT] Free unit for users

Set in up to 8 alphanumeric characters when item D40 is "Yes(1)"

(5) Item E (METER SETUP)

These items are for detector set up that has already been set before shipment.

A value in "( )" is the data corresponding to indicator.

[E10:NOMINAL SIZE] Nominal size of the detector

Select the nominal size of the flowmeter, from "15mm(0), 25mm(1), 40mm(2), 50mm(3), 80mm(4), 100mm(5), 150mm(6), 200mm(7), 250mm(8), 300mm(9)"

[E20:BODY TYPE] Body type for the detector

Select body type for detector from standard or high pressure.

Standard	(0) : Standard type
High Pressure	(1) : High Pressure type (tokuchu)
Low Flow Unit (1)	(2) : Reduced Bore type (option : /R1)
Low Flow Unit (2)	(3) : Reduced Bore type (option : /R2)

NOTE

Parameter setting for the Reduced Bore type, Select Low Flow Unit (1) or (2) and set. Set nominal size of the model code to E10: NOMINAL SIZE.

[E30:SENSOR TYPE] Sensor type for the detector

Select sensor type for the detector from standard or HT/LT

[E40:K-FACTOR UNIT],

Select this unit from p/l, p/Usgal, p/Ukgal.

[E41:K-FACTOR]

The flowmeter data plate includes a K-factor (KM) at 15°C for the combined detector.

[E50:DETECTOR NO.] Detector number of flowmeter

Set the serial number using 16 alphanumeric characters of the detector combined converter.

(6) Item F (Thermometer)

These items are for setting of thermometer and available when build in thermometer type (Option code: /MV).

[F10: Function] Thermometer function

Select the thermometer function.

Monitor only(0): Only temperature measurement.

Saturated Steam: Mass Flow rate is calculated from density values by temperature measurement using saturated steam table.

Superheat Steam: Mass Flow rate is calculated from density values by temperature measured by using steam table. In order to measure superheat steam. It is necessary to make constant pressure value.

GAS: STD/Normal: Volumetric flow rate at standard condition is calculated by using Pressure-Temperature correction. It is necessary to male constant pressure value.

Liquid: Mass: Mass flow rate is calculated by using the density change values depend on temperature values by which the secondary order function is used.

The following item should be done in case of which F10 is Saturated steam

[F12 MASS UNIT] Mass flow unit

Select mass rate unit from kg(0), t(1), lb(2), k lb(3).

The following items should be done in case of which F10 is Superheat steam

[F14 PRESS UNIT] Pressure unit

Select pressure unit from MPa abs(0), kPa abs(1), bar abs(2), kg/cm^2 a(3), psia(4).

[F15 PRESS f] Pressure value

Set absolute pressure values at operating condition.

[F16 MASS UNIT] Mass flow unit

Select mass flow unit from kg(0), t(1), lb(2), k lb(3).

The following items should be done in case of which F10 is GAS: STD/Normal

[F18 TEMP UNIT] Temperature unit

Select temperature unit from deg C(0), deg F (1).

[F19 TEMP b] Temperature b

Set temperature value at normal/standard condition.

[F20 PRESS UNIT] Pressure unit

Select pressure unit from MPa abs(0), kPa abs(1), bar abs(2), kg/cm^2 a(3), psia(4).

[F21 PRESS f] Pressure value f

Set absolute pressure values at operating condition.

[F22 PRESS b] Pressure value b

Set absolute pressure values at normal/standard Condition.

[F23 DEVIATION] Daviation factor

Set the daviation factor.

[F24 STD/NOR UNIT] Standard/Normal unit

Select Volumetric unit at standard/normal condition From Nm3(0), k Nm3(1), M Nm3(2), Nl(3), Sm3(4)

k Sm3(5), M Sm3(6), Sl(7), scf(8), k scf(9), M scf(10)

The following item should be done in case of which F10 is LIQUID:MASS

[F26 DENSITY UNIT] Density unit

Select density unit from kg/m3(0), lb/cf(1), lb/Usgal(2), lb/Ukgal(3).

[F27 DENSITY b] Density b

Set density value at standard condition.

[F28 TEMP UNIT] Temperature unit

Select temperature unit from deg C(0), deg F(1).

[F29 TEMP b] Temperature b

Set temperature value at standard condition

[F30 1st coef] lst coefficient

Set lst temperature coefficient using the density correction.

[F31 2nd coef] 2nd coefficient

Set lst temperature coefficient using the density correction.

[F32 MASS UNIT] Mass unit

Select mass flow rate unit from kg(0), t(1), lb(2), k lb(3).

[F35 TIME UNIT] Time unit

Select time unit from /s(0), /m(1), /h(2), /d(3).

[F40 FLOW SPAN] Flow span

Set span flow rate, 0 to 32000.

[F45 DAMPING] Flow damping

Set flow damping, 0 to 99sec.

[F50 TEMP DAMPING] Temperature damping

Set temperature damping, 0 to 99sec.

[F52 CABLE LENGTH] Cable length of signal cable(DYC)

Set cable length(m) of signal cable for DYA.

When type of model is integral, cable length is set in 0m.

IMPORTANT

Be sure to set this parameter to correct temperature measurement error, occured by cable length.

[F55 A/OUT SELECT] Analog out select

Select the analog output from FLOW(0), TEMP(1).

The following item should be done in case of which F55 is TEMP

[F56 TEMP 0%] Temperature at 0%

Set temperature value at 0%.

[F57 TEMP 100%] Temperature at 100%

Set temperature value at 100%.

[F58 TEMP ERR OUT] Output selection of thermometer error

Select output function when thermometer error from 0%(0), OUTLIMIT(H)(1), TEMP f.

In case of OUT LIMIT(H), it is based on parameter “D30”

(7) Item H (ADJUST)

This item for setting of adjustment.

[H10, H11:TRIM 4mA, TRIM 20mA] Triming of 4mA and 20mA

Fine tuning adjustment of 4mA and 20mA output.

Fine tuning range is form -1.00% to 1.00%.

[H20:USER ADJUST] Conversion factor for user setting.

Set conversion factor by user.

This conversion factor is converted into measurement flowrate.

[H25:REYNOLDS ADJ] Reynolds adjustment

Select the Reynolds adjustment.

This adjustment should be done in case of their error compensation, because error of vortex flowmeter should be increased when it come to low reynolds numbers.

The following item should be done in case of which “H25” is “ACTIVE”.

[H26:DENSITY f]

Set the density at operating condition.

[H27:VISCOSITY]

Set the value of density and viscosity at standard conditions. These values should be used for Reynolds adjustment. Reynolds number(Re) is calculated as shown in the formula below.

$$Re = 354 \times \frac{Q \cdot pf}{D \cdot v}$$

Q : Volumetric flow (m^3/h)
D : Internal diameter (m)
pf : Density at operating condition
μ : Viscosity (m Pa · s (cp))

Flowrate error of vortex flowmeter increases as Reynolds number decrease less than 20000.

By setting H25, H26, H27, it corrects the error.

[H30:EXPANSION FA] Gas expansion correction.

When measuring a compressibility gas by mass flow (Steam M, Gas M) and standard condition (Gas Qn), this expansion factor is useful to correct the deviation from the ideal gas law.

[H40:FLOW ADJUST] Select a break point correction

Select a break point correction for the instrumental error from “NOT ACTIVE(0) OR ACTIVE(1)”.

[H41, H45:FLOW ADJUST] Instrumental Error Correction

n Correct the instrumental error in flowmeter characteristics using 1 line-segment approximation (with five correction factors).

(1) Flow frequency input at line segments needs to be f_1-f_2-f_3-f_4-f_5.
When four correction factors are available, line segments need to be $f_4=f_5$ and $d_4=d_5$.
When three correction factors are available, line segments need to be $f_3=f_4=f_5$ and $d_3=d_4=d_5$.

(2) When a flow input of f_1 or less is present, correct the instrumental error as the corrected value=d_1.

(3) When a flow input of f_5 or more is present, correct the instrumental error as the corrected value=d_5.

(4) Abscissa (f_1 to f_5) : Set the break-point frequencies as parameters.

(5) Ordinate (d_1 to d_5) : Set the corrected value (%) at each break-point as parameters.

$$\text{Set value} = -\frac{Qs-I}{I} \infty 100$$

Where
Qs : Correct flowrate determined by a reference apparatus
I : Indication of vortex flowmeter

• Definition of error varies with the type of flowmeter. Be careful of the difference in signs in the error and corrected value.

$$Qf = \frac{f(Hz)}{K\text{-factor}} \infty 100$$

holds and the error is included in the K-factor.
Therefore, for the region where the K-factor shift on the positive side, the corrected value is negative.
The corrected value when the calibration fluid of the flowmeter and the fluid to be measured are different must be set as a corrected value obtained by making both abscissas agree with respect to the Reynolds number.

NOTE

D10: LOW CUT can be set after the items for compensations (H25, H30, H40) are set to “ACTIVE”.

(8) Item J (TEST)

These items are for test of output.

A value in "( )" is the data corresponding to indicator.

[J10:OUT ANALOG] 4 to 20mA Current output.

It tests 4 to 20mA Current output. Electric current of the set value (%) which designates 4 to 20mA as 0 to 100%.

When this test is executed, transistor contact output (Pulse, Alarm, Status) is fixed at ON or OFF (not determined).

Exiting this parameter item or stopping access after ten minutes, this function will be reset automatically.

[J20:OUT PULSE] Pulse output

It tests Pulse output.

The number of pulses which is set (unit: PPS) is output.

Exiting this parameter item or stopping access after ten minutes, this function will be reset automatically.

When this test is executed, current output is fixed at 0% (4mA).

[J30:OUT STATUS] Status output test

Status output test can be executed (OFF(0) or ON(1)).

When this test is executed, current output is fixed at 0% (4mA).

Exiting this parameter item or stopping access after ten minutes, this function will be reset automatically.

(9) Item K (Maintenance)

These items are for maintenance.

A value in "( )" is the data corresponding to indicator.

[K10:TLA] TLA Adjustment

Trigger level (TLA) is adjusted upon shipment. Therefore, TLA adjustment is nonnecessity. But set TLA adjustment below as

- The measurement of Low flow rate area is required.
- Mechanical vibration and impact are applied to digitalYEWFLO and Zero point and low flow rate area is output.

  Note: Refer to "6.2 Adjustment for Manual Mode".

[K20:SIGNAL LEVEL]

Set the signal level.

[K25:N. B. MODE]

Set the Noise Balance Mode from "AUTO(0)" or "MANUAL(1)" or "TUNING AT ZERO(2)"

[K26:N. B.RATIO] The ratio of Noise Balance.

When "NOISE BALANCE MODE (N. B. MODE)" is "AUTO", noise balance value is the indication only.

When N.B. mode is "MANUAL", the noise balance can be adjusted entering the setting values.

Note: Refer to "6.2 Adjustment for Manual Mode".

[K28:SET VORTEX F] Output test by setting simulated frequency.

Amplifier check is executed by simulated frequency input.

Output to be able to check are, analog output, pulse output/ contact output.

Test status also can be seen on display board.

NOTE

- In case of multi-variable type (/MV), output value is calculated by setting density and temperature.
- Available for 5.10 or greater version that can be checked in K50 SOFTWARE REV.

[K30:VELOCITY] Flow velocity

Indication of flow velocity at the operating conditions.

[K32:SPAN V] Flow span velocity

Indication of flow span velocity.

When /MV is selected and "F10 : FUNCTION" is "Saturated Steam" or "Superheat Steam" and "GAS : STD/Normal" or "LIQUID : Mass", the display of span velocity may differ from an actual value.

[K34:VORTEX FREQ.] Vortex frequency.

Indication of vortex frequency at operating conditions.

[K36:SPAN F] Span vortex frequency.

Indication of span vortex frequency.

When /MV is selected and "F10 : FUNCTION" is "Saturated Steam" or "Superheat Steam" and "GAS : STD/Normal" or "LIQUID : Mass", the display of span frequency may differ from an actual value.

[K40:ERROR RECORD] Error record

The error record can be indicated.

- The error is recorded as history.
- The error history is not time-series data.
- The error history can be holded for 30 days.

In order to clear an error record, set the video inverse bar by "< >" and press "ENTER"key twice.

[K50:SOFTWARE REV] Software revision

The software revision can be indicated.

5.5 Error Code Lists

When an ERROR is displayed by SELF CHECK in item A60, B60, C60, D60, E60, or H60, J60, K60, M60, press function key F2 [DIAG] on BRAIN Terminal and the error contents are displayed.

The error contents are listed below:

Table 5.1 ERROR Code List

Indication	Diagnostic Message	Error Name	Problem Cause	Current Output		% Output		Pulse Output	Engineering Unit Output	Totalizing Output	Engineering Temp Output	Pulse / Status Output			How to recover
				Select flow rate	Select temperature	Select flow rate	Select temperature					Pulse(*2)	Status(*2)	Alarm(*2)	
Err-01	OVER OUTPUT	Over range output signal	Output signal is 110% or more	Fixed at 110%(*1)	Normal Operation	Fixed at 110%(*1)	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	Change parameters or over ranged flow input
Err-02	SPAN SET ERROR	Span Setting Error	Span setting parameter is more than 1.5 times of max flow velocity	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	Change parameters span factor is outside the acceptable limits
Err-06	PULSE OUT ERROR	Pulse output error	Pulse output frequency is more than 10kHz	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Fixed at 10KHz	Normal Operation	Normal Operation	Normal Operation	Fixed at 10kHz			Change parameters (ItemC,ItemE)
Err-07	PULSE SET ERROR	Pulse setting error	Pulse output frequency setting is more than 10kHz	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation			Change parameters (ItemC,ItemE)
CHECK Vibration	Transient noise	Error of Vibration	Transitional disturbance	Hold	Normal Operation	Hold	Normal Operation	Normal Operation	Hold	Normal Operation	Normal Operation	Hold	Hold	OFF(H)	CHECK the vibration
CHECK Vibration	High vibration	Error of Vibration	High vibration	Based on K45	Normal Operation	Based on K45	Normal Operation	Stop Output	Based on K45	Stop the total	Normal Operation	Normal Operation	Normal Operation	OFF(H)	CHECK the vibration
CHECK Flow	Fluctuating	Error of Flow	Fluctuating	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	CHECK the clogging
CHECK Flow	Clogging	Error of Flow	Clogging	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	CHECK the clogging
Err-10	TEMP OVER OUTPUT	Over range Temp output signal	Temp output signal is 110% or more, and 0% below.	Normal Operation	Fixed at 110% in case of over 110%, and fixed at 0% when in case of less than 0%(*1)	Normal Operation	Fixed at 110% in case of over 110%, and fixed at 0% when in case of less than 0%(*1)	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	CHECK the temperature or temperature span
Err-11	OVER TEMP	Error of temperature	Temp value is -50C below or 300C over.	Remain in operationat Temp=-50C or Temp=300C	Remain in operation at Temp=-50C or Temp=300C	Remain in operationat Temp=-50C or Temp=300C	Remain in operation at Temp=-50C or Temp=300C	Remain in operation at Temp=-50C or Temp=300C	Remain in operationat Temp=-50C or Temp=300C	Remain in operation at Temp=-50C or Temp=300C	Remain in operation at Temp=-50C or Temp=300C	Remain in operation at Temp=-50C or Temp=300C	Remain in operation at Temp=-50C or Temp=300C	OFF(H)	CHECK the temperature
Err-12	TEMP SENSOR FAULT	Error of thermometer	Disconnection or short of thermometer sensor	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	OFF(H)	Change thermometer sensor.
Err-13	TEMP CONV. FAULT	Error of temperature converter	Temperature converter is failed	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	OFF(H)	Change converter case build in temperature sensor.
Err-20	PRE-AMP ERROR	PRE-AMP is failed		Normal Operation	Remain in operation at Manual Setting Temperature Value	Normal Operation	Remain in operation at Manual Setting Temperature Value	Normal Operation	Normal Operation	Normal Operation	Remain in operation at Manual Setting Temperature Value	Normal Operation	Normal Operation	OFF(H)	Replace the AMP. unit
Err-30	EEPROM ERROR	EEPROM is not functioning correctly		Over 110% or -2.5% below	Over 110% or -2.5% below	Fixed at 0%	Fixed at 0%	Halt	Fixed at 0%	Halt	Fixed at 0%	Stop the Output	OFF(H)	OFF(H)	Replace the AMP. unit
Err-40	FLOW SENSOR FAULT	Error of Flow sensor	Flow sensor is fault.	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	Change Flow sensor
	CPU FAULT	CPU is failed	All operations are Dead. Display and self diagnostic function is also dead.g	Over 110% or -2.5% below	Over 110% or -2.5% below	Halt	Halt	Halt	Halt	Halt	Halt	Halt	Halt	Halt	Replace the AMP. unit

Note. Normal Operation : Operation continues without relation to error occurrence.
Remain in Operation : Calculation continues with relation to error occurrence.

(*1) "110%" is based on "D30 : OUT LIMIT(H)".
(*2) Pulse output : These conditions should be done in case of which B20 is "SCALED PULSE", "UNSCALED PULSE", "FREQUENCY".
Status output : These conditions should be done in case of which B20 is "FLOW SW (LOW : ON)", "FLOW SW (LOW : OFF)".
Alarm output : These conditions should be done in case of which B20 is "Alarm".

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6. OPERATION

After you have installed the flowmeter into the process piping, wired the input/output terminals, set up the required parameters, the vortex flowmeter should output an accurate flow signal from its terminals as soon as the measured liquid begins to flow.

This section describes procedure of test method and adjustment method for the pre-operation.

6.1 Adjustment

6.1.1 Zero Adjustment

No zero adjustment is necessary since the zero point does not shift.

Because of the effect of electrical noise and vibration noise, digitalYEWFLO may provide an output even when the flowrate is zero. In that case, properly eliminate the source of the noise.

Refer to “6.2 : Adjustment for manual mode”.

6.1.2 Span Adjustment

In normal application, you need not confirm the span.

If you need to ensure the output of 4 to 20mA DC, refer to “6.1.3 Loop Test”.

6.1.3 Loop test

To ensure output of 4 to 20mA DC or pulse, their loop tests can be done using parameter “J10 (Analog out)” or “J20 (Pulse test)”.

If you are verifying the analog output, follow the procedure on the verification procedure.

<Check Procedure>

1. Connect the instruments referring to Figure 6.1, and warm up for three minutes more.
2. Set span frequency in Parameter J10:OUT ANALOG.
3. In case the load resistance is 250 ohm, digital multimeter indicates 5V. Otherwise if it is known load resistance value, it indicates R x 0.02A.
4. Check output value after set 50% in Parameter J10.
5. Check output value after set 0% in Parameter J10.

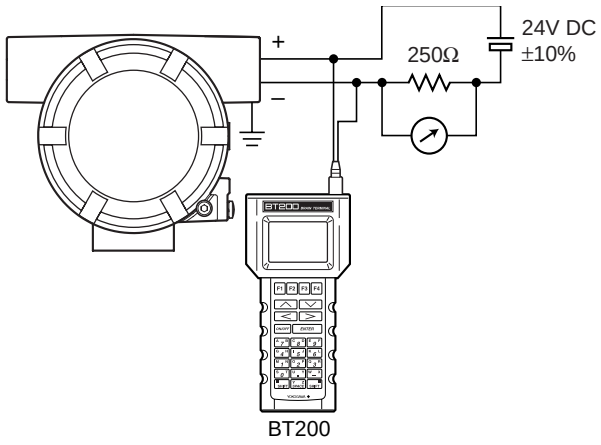

Figure 6.1 Connection of Maintenance Instruments

IMPORTANT

- When using any test-purpose measuring instruments, do not ground them.
- All of your parameter settings will be cancelled if you turn digitalYEWFLO off less than 30 seconds after the parameter setup. Keep digitalYEWFLO turned on at least 30 seconds after setting up the parameters.

6.1.4 Totalizer Function Start and Totalized Value Reset

When using the Totalizer Function, the start setup should be done.

(1) Start operation using BT200
Enter to B40(TOTAL START), and move the video bar to “EXECUTE”. Push “ENTER” key at 2 times.
(2) Start operation using indicator
Enter to “Setting mode”, move to B40 of parameter number, and enter to “01” of data number.
Refer to “4.4: Setting mode”.

Totalized value can be reset using the indicator or BT200.

(1) Reset operation using BT200
Enter to B42 (TOTAL RESET), and move the video bar to “EXECUTE”. Push “ENTER” key at 2 times.
(2) Reset operation using indicator
Enter to “Setting mode”, move to B42 of parameter number, and enter to “01” of data Number.
Refer to “4.4 : Setting mode”.

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6.1.5 Unit of Pulse Output (Scaling)

Pulse output are constructed by two units, that are “Scaled pulse and Unscaled Pulse”.

(1) Scaled Pulse

When SCALED PULSE is selected in B20, set flowrate per one pulse output. Rate unit is linking to the flow unit.

(2) Unscaled Pulse

When UNSCALED PULSE is selected in B20, it output number of vortex (vortex frequency) as a pulse-number, which is detected from vortex shedder bar. (1.0 must be set for this.)

Refer to 7.6 (1) Flow calculation.

l Pulse Rate setting

Pulse rate setting are settable by “B21:PULSE RATE”.

6.1.6 Power Failure

When a power failure occurs, the totalized value will be protected by EEPROM (Electrically Erasable Programmable ROM). But during a power failure, the vortex flowmeter stops and also the totalizing will stop.

After a power is recovered, the vortex flowmeter and the totalizing start to work automatically.

EEPROM doesn’t need a battery for backup.

6.2 Adjustment for Manual Mode

digitalYEWFLO does not need the initial adjustment because digitalYEWFLO is always adjusted by itself automatically.

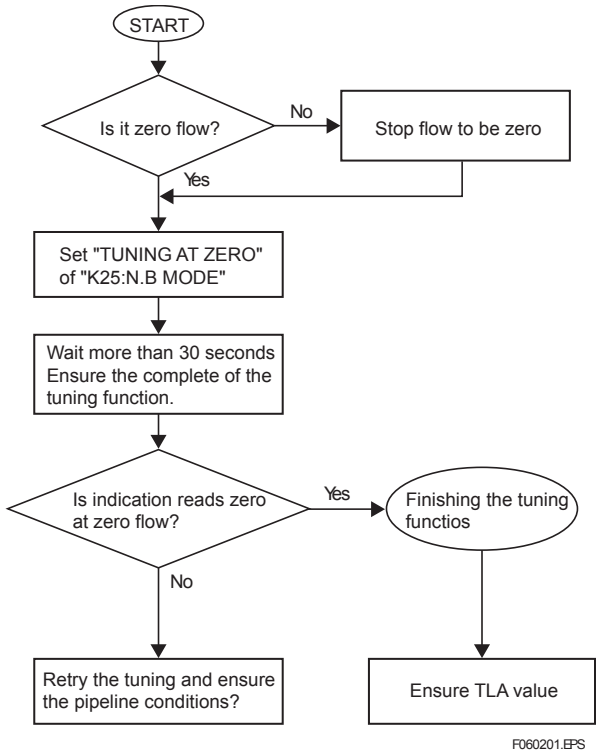
These adjustments should be done in case that indicator reads over zero at zero flow.

6.2.1 Low Cut Adjustment

Adjust to noise elimination or zero flow in the low flowrate (or low frequency) range.
The settable range for low cut flowrate is below half of minimum flowrate.

6.2.2 Tuning

This adjustment should be done according to a flow figure shown below.


START
Is it zero flow?
No
Stop flow to be zero
Yes
Set "TUNING AT ZERO" of "K25:N.B MODE"
Wait more than 30 seconds Ensure the complete of the tuning function.
Is indication reads zero at zero flow?
Yes
Finishing the tuning functios
No
Retry the tuning and ensure the pipeline conditions?
Ensure TLA value
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If this adjustment is executed, the following value is changed.

K25:N.B MODE = MANUAL

K26:NOISE RATIO=Constant value

Minimum flowrate is increased when TLA value is changed form initial value.

1. Tuning method

(1) Ensure the condition of flowrate
The necessary condition for tuning function is zero flow.

(2) Executing the tuning function.
Set " TUNING AT ZERO" of "K25:N.B MODE".
Wait more 30 second.

(3) Finishing the tuning functions
Using the BT200
(a) Press "DATA" key of BT200 function key.
(b) Ensure the indication of "MANUAL" which is "K25:N.B MODE"
("NOW TUNING" is indicated during tuning operation.)
Using the indicator
(a) Press "SHIFT" and "SET" key simultaneously.
(b) Press "SET" key and ensure "01" of Lower indication.
("02" is indicated during tuning operation. Execute (a), (b) once again.)

2. TLA value

TLA values is possible to change after executing "TUNING". In this case, minimum flowrate is increased.

Minimum flowrate for TLA value is given by below equation.

$$\text{Minimum Flowrate after changing TLA Value} = \text{Specified Minimum Flowrate} \times \sqrt{\frac{\text{TLA Value after Tuning}}{\text{TLA initial value or defalt value}}}$$

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Ensure minimum flowrate for changing TLA value.

3. Output

After tuning, ensure that the indication reads is zero where no fluid is flowing.

If the indication reads over zero is done continuously, retry the tuning and ensure the below condition.

Does high vibrations occur in pipeline?

In this case, refer to "2:INSTALLATION", and keep the pipeline properly.

6.3 Other Maintenance

6.3.1 Cleaning Precautions

Care should be taken to prevent the build up of dirt, dust or other material on the display glass and data plate. In case of its maintenance, soft and dry cloth is used.

7. MAINTENANCE

CAUTION

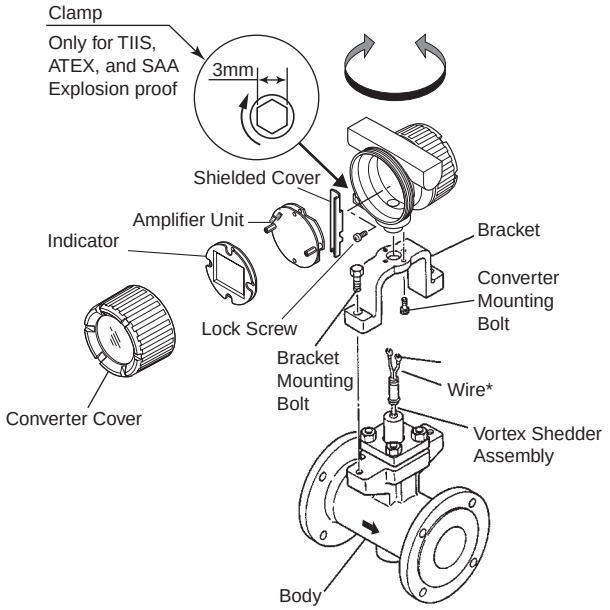
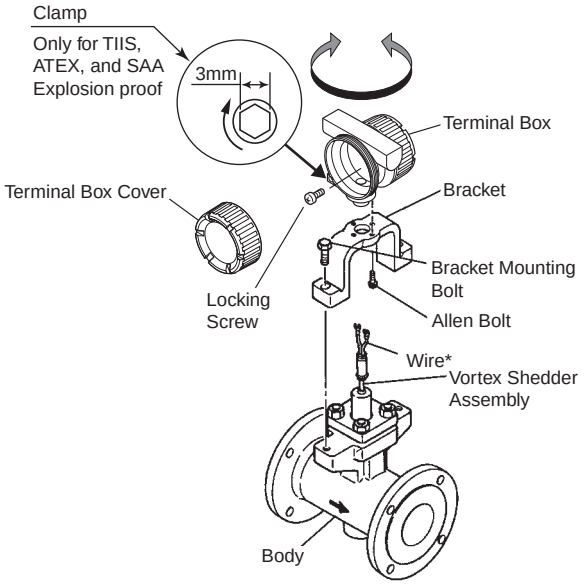
- Disassemble work should be done only for error occurrence.
- Maintenance work must be carried out by expert engineer or skilled personnel and not by operators.
- Before opening the cover, it is important to ensure that at least 10 minutes have passed since the power was turned off. Furthermore, opening of the cover must also be carried out by expert engineer or skilled personnel.

CAUTION

- It is prohibited by law for the user to modify flameproof instruments. It is not permitted to add or remove indicators. If modification is required, contact YOKOGAWA.
- Explosion protected type must be, as a rule, removed to a non-hazardous area for maintenance and be disassembled and reassembled to the original state.
- For TIIS, ATEX and SAA explosion proof, the display cover is locked by the clamp. In case of opening the display cover, use the hexagonal wrench attached.
- Be sure to lock the cover by the clamp using the hexagonal wrench attached after installing the cover.

7.1 Changing the Terminal Box Orientation

The terminal box can be changed in four directions with respect to the flow direction.

Integral Type Vortex Flowmeter	Remote Converter Type Vortex Flowmeter
<1> Remove the converter cover. <2> For amplifier unit removal, refer to paragraph 3.7.2. <3> Disconnect the vortex shedder assembly lead-wires from the converter. <4> Remove the bracket mounting bolts and remove the converter and bracket from the flowmeter body. The bracket applies to the 1 (25mm) to 4 (100mm) inch flowmeters. <5> Remove the four allen bolts securing the converter to the bracket. <6> Turn the converter to the desired orientation. When reassembling the converter, reverse the above procedure.	<1> Remove the terminal box cover. <2> Loosen two screws to disconnect leadwires from shedder bar. <3> Remove the bracket mounting bolts and remove the terminal box and bracket from the flowmeter body. The bracket applies to the 1 (25mm) to 4 (100mm) inch flowmeters. <4> Remove the four allen bolts securing the terminal box to the bracket. <5> Turn the terminal box to the desired orientation. When reassembling the terminal box, reverse the above procedure.
	

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7.2 Indicator Removal and Rotation

(1) Turn the power OFF.
(2) Remove the cover.
    * In case of the Explosion protected type, remove the cover after unlock the clamp.
(3) For the indicator, disconnect the cable connector from the amplifier unit.
(4) Loosen the two indicator mounting screws using a Phillips screwdriver.
(5) Pull out the indicator.
(6) Reinstall the indicator in the reverse order to its removal (above) and secure the mounting screws.

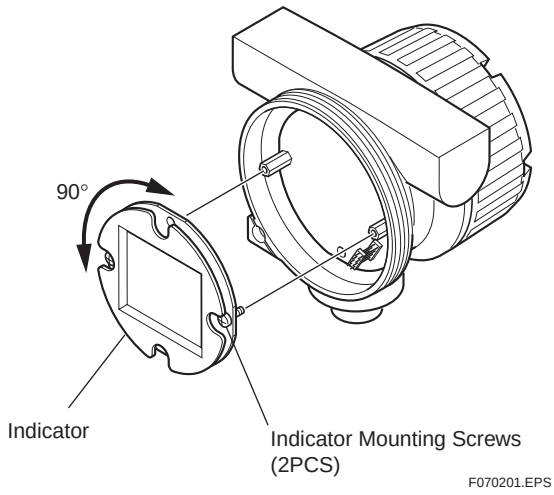

Figure 7.1 Removing and Reinstalling the Indicator

7.3 Amplifier Unit Removal

IMPORTANT

Do not turn the amplifier unit for removal or assembling. The connector pins may be damaged.

(1) Turn the power OFF.
(2) Remove the converter cover.
    * In case of the Explosion protected type, remove the cover after unlock the clamp.
(3) Remove the indicator according to the procedures described in paragraph 7.2.
(4) Loosen the terminal screws and remove the amplifier unit.

7.4 Amplifier Unit Assembling

IMPORTANT

The amplifier unit must be assembled keeping the procedure as follows. Amplifier may not operate normally when the procedure does not keep.

(1) Put two-mounting pins① into mounting hole②.
(2) Push the head of two mounting screws④ lightly.
(3) Push head of two IC⑤ and mount the amplifier unit③.
(4) Tighten two mounting screws④.

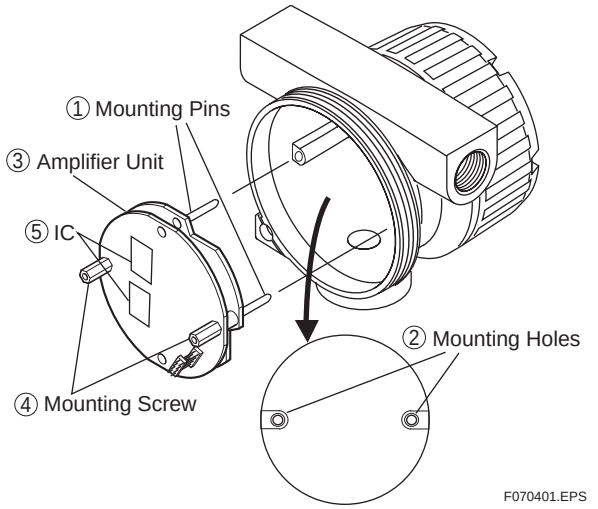

Figure 7.2 Removing and Reinstalling the Amplifier Unit

7.5 Vortex Shedder Removal

CAUTION

- Disassemble work should be done only for error occurrence.
- Only expert engineer or skilled personnel are permitted to open the cover.
- When the vortex shedder is disassembled, and empty the flow tube before the gasket must be replaced with a new one.
- Output error may cause when the shedder bar is not restored correctly.
- For Explosion proof type, move vortex flowmeter to non-hazardous area firstly, then do the assemble work.

(1) Remove the converter cover.
(2) For Integral Type, loosen the terminal screws and disconnect leadwires on the amplifier and loosen 4 screws to disassemble the Amplifier. And for Remote Type, remove the terminal box cover in the same way.
(3) Loosen the bracket mounting bolts and remove the terminal box together with the bracket. Be careful not to damage the leadwires connected to the vortex shedder assembly when removing the terminal box.
(4) Loosen the vortex shedder assembly mounting bolts or nuts and remove the vortex shedder assembly.
(5) When reassembling the vortex shedder assembly, reverse above procedure. Confirm the following.
   a. The gasket should be changed to new one.
   b. The guide pin on the vortex shedder mounting block meets the guide pin hole. See Figure 7.3. The guide pin applies to the 1 to 4 inch flowmeters.
   c. The vortex shedder assembly is installed as illustrated in Figure 7.3.
   d. Tighten the sensor mounting bolts or nuts with a torque wrench, applying the torque specified below.

Table 7.1 Torque Value

UNIT: kg·m (b·in)

Nominal Size mm (inch)	Standard	High Temperature (HPT)	
		A	B
15 (1/2)	1.6 (140)		
25 (1)	1.2 (105)	1.75 (153)	1.2 (105)
40 (1-1/2)	1.2 (105)	1.75 (153)	1.2 (105)
50 (2)	2 (174)	5 (435)	2 (174)
80 (3)	3 (260)	10 (870)	4 (348)
100 (4)	4 (348)	10 (870)	5 (435)
150 (6)	5 (435)	7 (608)	5 (435)
200 (8)	7 (610)	10 (870)	7 (608)
250 (10)	16 (1390)		
300 (12)	16 (1390)		

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In case of High Temperature Version (Option code: HT), First time tighten Nuts with a torque wrench, applying the torque specified “A”.

Next time loosen Nuts completely, then again tighten Nuts with a torque wrench, applying the torque specified “B”.

   e. Insert the leadwires (vortex shedder) through the terminal box bottom hole and lower the terminal box slowly until the bracket touches the flowmeter shoulder. Be sure to keep the leadwires vertical while lowering the terminal box.
   f. After assembling, confirm that there is no leakage from the vortex flowmeter.

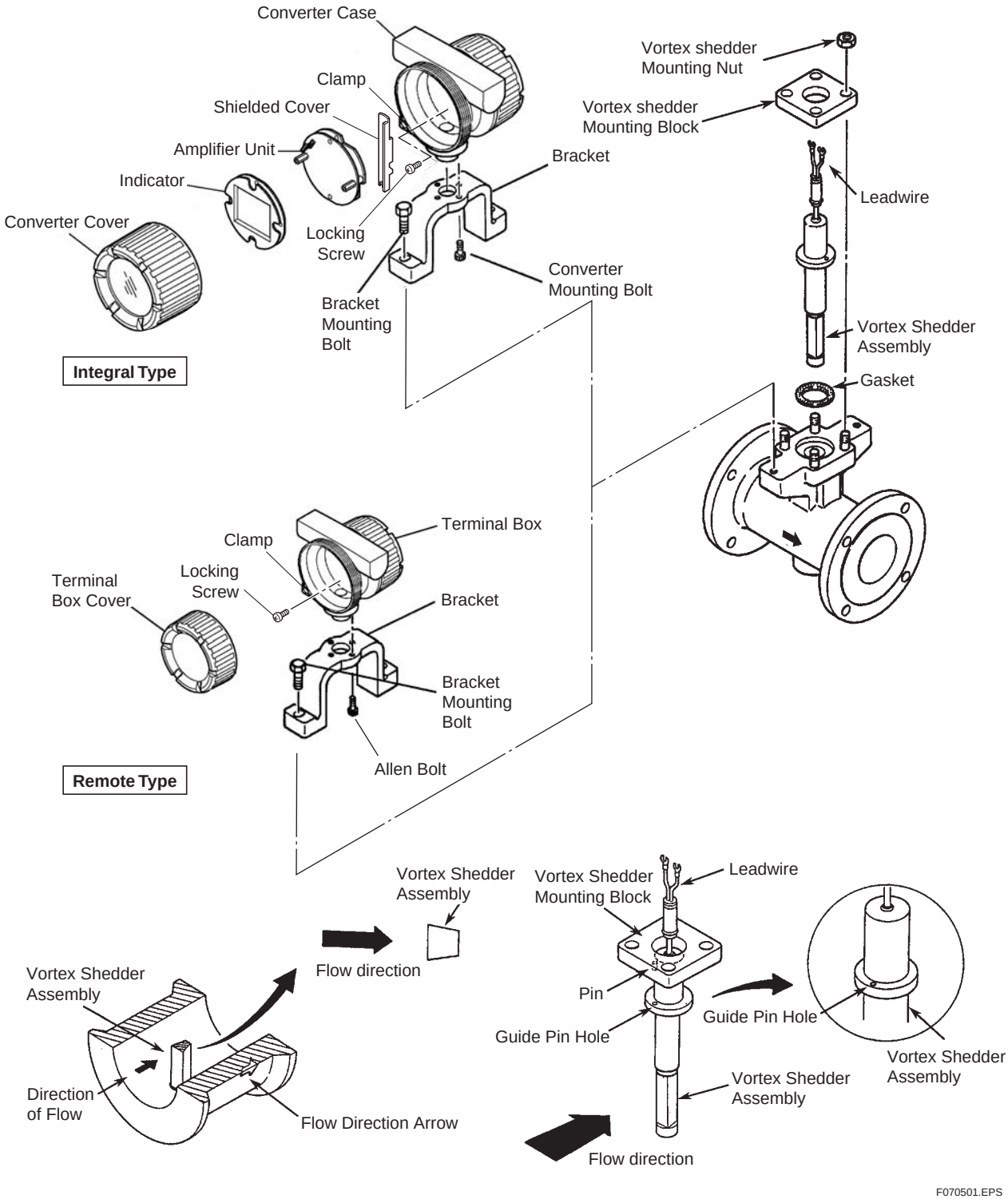

Figure 7.3 Disassembling and Reassembling the Vortex Shedder Assembly

7.6 Setting Switches

7.6.1 Setting of Burnout Switch

digitalYEWFLO is equipped with a CPU error burnout function used to set the output direction upon CPU error, and a sensor burnout function that sets the direction of the output in the event of burnout of the temperature sensor. When factory-shipment under normal conditions, the output of both CPU error burnout and sensor burnout are set to HIGH, but if suffix code/C1 is specified, the CPU error burnout is set to LOW(-2.5% below) output, and sensor burnout is set to LOW(-2.5% below) output, respectively. The setting of the direction of output from burnout can be changed.

To change the direction of output arising from burnout, switch the setting pin on the CPU assembly (see Table 7.2).

Table 7.2 Output Setting Pin for Burnout

Pin position	CPU error burnout direction	CPU error burnout output	Remark
L H	HIGH	110% or more (21.6mA DC)	Set to HIGH before shipment.
L H	LOW	-2.5% or less (3.6mA DC)	Set to LOW for option specification code / C1.

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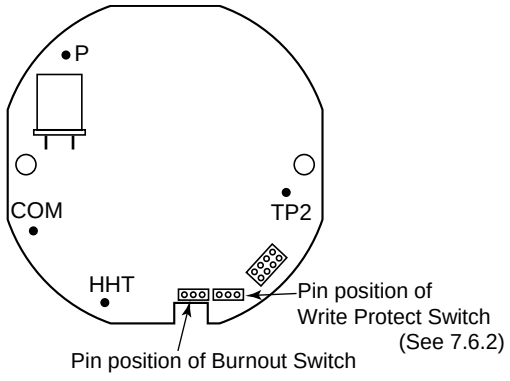

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Figure 7.4 Pin position of Burnout and Write Protect Switch

7.6.2 Setting of Write Protect Switch

By setting the write protect function to “Protect”, it is possible to prevent the overwriting of parameters. Write protection can be carried out using either the hardware switch on the CPU board (i.e., Switch 2) or software parameter settings. If either of these items is set to “Protect”, the overwriting of parameters will be prohibited.

NOTE

If the hardware switch is set to “Protect”, it will not be possible to overwrite parameters; furthermore, this condition will be maintained until the switch is set to “Enable”.

For more details regarding usage of the write protect function and the software’s parameter switches, refer to 4.6.11 Write Protect.

Table 7.3 Setting pin for Write Protect

Pin position	CPU error burnout direction
Y N	Enable
Y N	Protect

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7.7 Software Configuration

(1) Flow Calculation

The flowrate is calculated with the following equations based on the N number of generated vortices:

(a) Flowrate (in engineering units)

$$RATE=N\cdot\frac{1}{t}\cdot\varepsilon_f\cdot\varepsilon_e\cdot\varepsilon_r\cdot\frac{1}{KT}\cdot U_k\cdot U_{TM} \quad \text{.... (7.1.1)}$$

$$KT=KM\cdot U_{KT}\cdot\{1-4.81\times(Tf-15)\times10^{-5}\} \quad \text{.... (Metric Units) .... (7.1.2)}$$

$$KT=KM\cdot\{1-2.627\times(Tf-59)\times10^{-5}\} \quad \text{.... (English Units) .... (7.1.3)}$$

(b) Flowrate (%)

$$RATE(\%)=RATE\cdot\frac{1}{F_S} \quad \text{.... (7.2)}$$

(c) Totalized value

$$TOTAL=TOTAL+nTOTAL$$

$$TOTAL=RATE\cdot t\cdot\frac{1}{T_R}\cdot\frac{1}{U_{TM}} \quad \text{.... (7.3)}$$

(d) Pulse output frequency

$$PULSE\ FREQ=RATE\cdot\frac{1}{P_R}\cdot\frac{1}{U_{TM}} \quad \text{.... (7.4.1)}$$

$$PULSE\ FREQ=N\cdot\frac{1}{t}\cdot\frac{1}{P_R} \quad \text{.... (Unscaled pulses) .... (7.4.2)}$$

(e) Velocity

$$V=N\cdot\frac{1}{t}\cdot\frac{1}{KT}\cdot U_{KT}\cdot\frac{4}{\pi D^2} \quad \text{.... (7.5)}$$

(f) Reynolds number

$$Red=V\cdot D\cdot\rho_f\cdot\frac{1}{\mu}\times1000 \quad \text{.... (Metric Units) .... (7.6.1)}$$

$$Red=V\cdot D\cdot\rho_f\cdot\frac{1}{\mu}\times124 \quad \text{.... (English Units) .... (7.6.2)}$$

where N: Number of input pulses (pulse)
Δt: Time corresponding to N (seconds)
ε_f: Instrumental error correction factor
ε_e: Expansion correction factor for compressive fluid
ε_r: Reynolds number correction factor
KT: K-factor at operating conditions (pulses/litre) (pulse/gal)
KM: K-factor at temperature 15°C (59°F)
U_{KT}: Unit conversion factor for K-factor
U_k: Flow unit conversion factor (Refer to item (2))
U_k(user): Flow unit conversion factor for user's unit
U_{TM}: Factor corresponding to flow unit time (ex./m (minute) is 60.)
S_E: Span factor (ex. E+ 3 is 10^3.)
P_E: Pulse rate (ex. E+ 3 is 10^3.)
T_f: Temperature at operating conditions (°C) (°F)
F_S: Flowrate span
T_E: Total factor
D: Internal diameter (m) (inch)
μ: Viscosity (cP)
ρ_f: Density at operating conditions (kg/m³) (lb/ft³)

(2) Flow Conversion Factor (Uk)

Flow conversion factor Uk is obtained by carrying out the following computation depending on the selection of the fluid to be measured and the flow unit.

(a) Steam
M (Mass flowrate): $U_k=\rho_f\cdot U\rho_f\cdot U_k$ (kg) .... (7.7.1)
$U_k=\rho_f\cdot U_k$ (lb) .... (7.7.2)
Qf (Flowrate at operation): $U_k=U_k$ (m³) .... (7.7.3)
$U_k=U_k$ (acf) .... (7.7.4)

(b) Gas
Qn: (Flowrate at STP):

$$U_k=\frac{P_f}{P_n}\cdot\frac{P_f+273.15}{P_n+273.15}\cdot\frac{1}{K}\cdot U_{k\,(Nm^3)} \quad \text{.... (7.8)}$$

$$U_k=\frac{P_f}{P_n}\cdot\frac{\frac{5}{9}(T_n-32)+273.15}{\frac{5}{9}(T_n-32)+273.15}\cdot\frac{1}{K}\cdot U_{k\,(scf)}$$

M: (Mass flowrate): $U_k=\rho_f\cdot U\rho_f\cdot U_k$ (kg) .... (7.9.1)
$U_k=\rho_f\cdot U\rho_f\cdot U_k$ (lb) .... (7.9.2)
Qf: (Flowrate): $U_k=U_k$ (m³) .... (7.10.1)
$U_k=U_k$ (acf) .... (7.10.2)

(c) Liquid
Qf: (Flowrate): $U_k=U_k$ (m³) .... (7.11.1)
$U_k=U_k$ (acf) .... (7.11.2)
M (Mass flowrate): $U_k=\rho_f\cdot U$ (kg) .... (7.12.1)
$U_k=7.481\times\rho_f\cdot U$ (lb) .... (7.12.2)
7.481 is a conversion factor of U.S gal into acf

(d) User's unit
$U_k=U_k$ (user) .... (7.13)

where
M: Mass flow
Q_n: Volumetric flow in a Normal condition
M: Mass flow
Q_f: Volumetric flow in an operating condition
ρ_f: Specific weight (kg/m³), (lb/acf)
h_f: Specific enthalpy (kcal/kg), (Btu/lb)
T_f: Temperature in an operating condition (°C), (°F)
T_n: Temperature in a Normal condition (°C), (°F)
P_f: Pressure in an operating condition (kg/cm² abs), (psia)
P_n: Pressure in a Normal condition (kg/cm² abs), (psia)
K: Deviation factor
ρ_n: Density in a Normal condition (kg/Nm³), (lb/scf)
ρ_f: Density in an operating condition (kg/m³), (lb/acf)
$U\rho_f$: Unit conversion factors of density.

$U_{k(kg)}$, $U_{k(Nm3)}$, $U_{k(m3)}$
$U_{k(lb)}$, $U_{k(Btu)}$, $U_{k(scf)}$, $U_{k(acf)}$: Unit conversion factors

(3) Mass Flow calculation

a) Steam
In case of saturated steam, mass flow rate is calculated from density values to temperature measured by using saturated steam table.

In case of superheat steam, mass flow rate is calculated from density values to temperature measured by using steam table. In order to measure superheat steam, it is necessary to make constant pressure value. A pressure values which is entered in parameter is used.

$$M = \rho_{ft} \cdot Q_f \quad \text{.....(7.14.1)}$$

b) Gas
In case of gas, Volumetric flow rate at standard condition is calculated, so Pressure-Temperature correction is carried out. It is necessary to make constant pressure value. A Pressure values at operational condition, temperature and pressure value at standard condition which is entered in parameter is used.

$$Q_n = Q_f \cdot \frac{P_f}{P_n} \cdot \frac{T_n + 273.15}{T_{fT} + 273.15} \cdot \frac{1}{K} \quad \text{.....(7.14.2)}$$

c) Liquid
In case of liquid, mass flow late is calculated from which used to calculate the secondary function for the density value to the temperature. A density value which indicated by the order sheet is used.

$$M = \rho_n \cdot Q_f \cdot \{1 + a_1(T_{ft} - T_n) \cdot 10^{-2} + a_2(T_{ft} - T_n)^2 \cdot 10^{-6}\}$$
$$\text{.....(7.14.3)}$$

Where

- M : Mass flow
- Q_n : Volumetric flow rate in a Standard condition
- Q_f : Volumetric flow rate in a operating condition
- ρ_{ft} : Density calculated by temperature value
- ρ_n : Density in a Standard condition (kg/m^3), (lb/cf)
- P_f : Pressure in an operating condition (kPa abs), (psi)
- P_n : Pressure in a standard condition (kpa abs), (psi)
- T_n : Temperature in an operating condition (°C), (°F)
- T_f : Temperature in a standard condition (°C), (°F)
- T_{ft} : Measured temperature value (°C), (°F)
- a_1 : 1st temperature coefficient
- a_2 : 2nd temperature coefficient

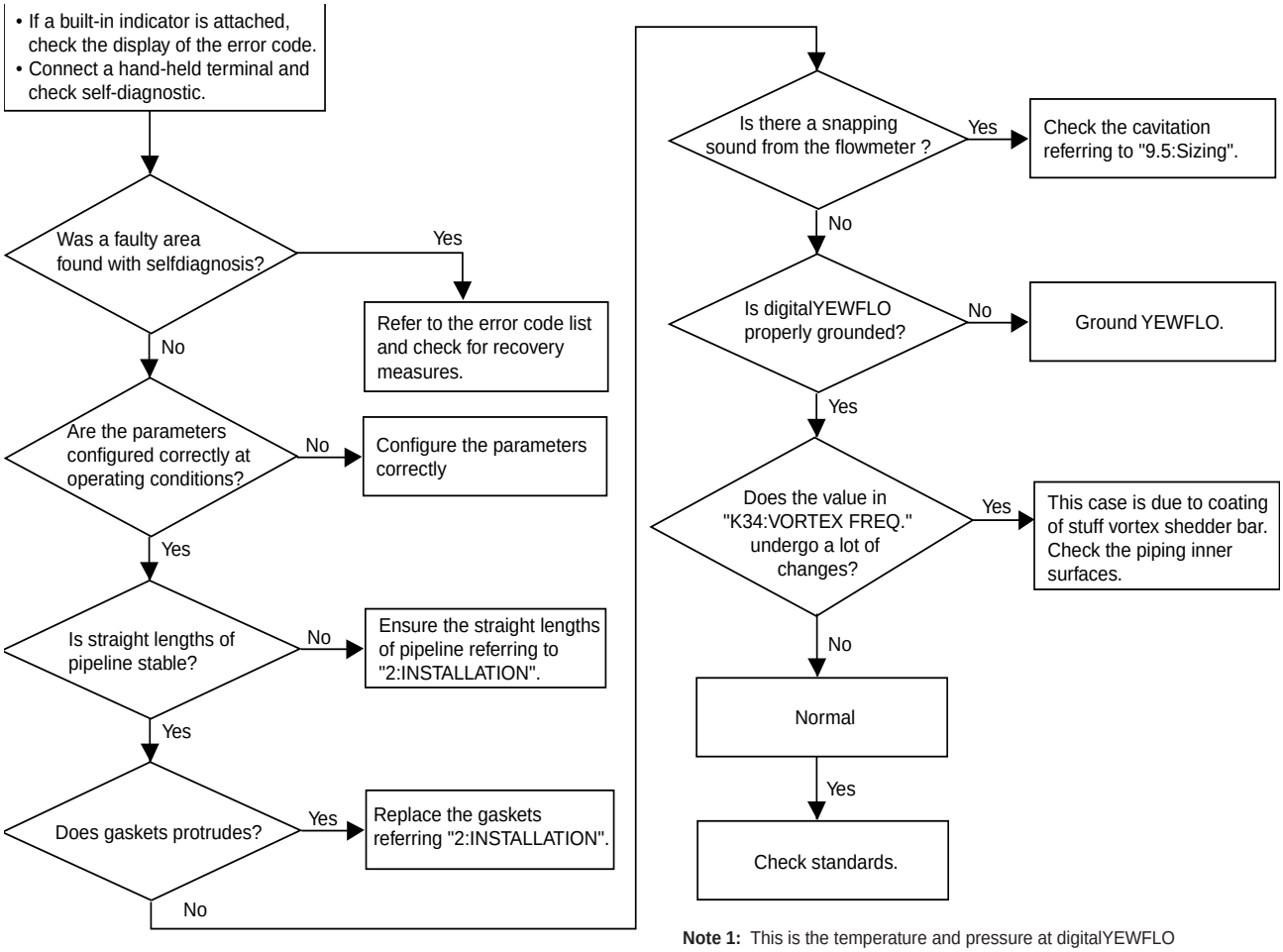
8. TROUBLESHOOTING

CAUTION

Please avoid replacing the amplifier unit from the case, and the vortex shedder bar. When these procedures are needed, please contact the nearest Yokogawa office.

8.1 Flow

Large flowmeter errors and flowrate reading fluctuates.


• If a built-in indicator is attached, check the display of the error code.
• Connect a hand-held terminal and check self-diagnostic.
Was a faulty area found with selfdiagnosis?
Yes
Refer to the error code list and check for recovery measures.
No
Are the parameters configured correctly at operating conditions?
No
Configure the parameters correctly
Yes
Is straight lengths of pipeline stable?
No
Ensure the straight lengths of pipeline referring to "2:INSTALLATION".
Yes
Does gaskets protrudes?
Yes
Replace the gaskets referring "2:INSTALLATION".
No
Is there a snapping sound from the flowmeter ?
Yes
Check the cavitation referring to "9.5:Sizing".
No
Is digitalYEWFLO properly grounded?
No
Ground YEWFLO.
Yes
Does the value in "K34:VORTEX FREQ." undergo a lot of changes?
Yes
This case is due to coating of stuff vortex shedder bar. Check the piping inner surfaces.
No
Normal
Yes
Check standards.

Note 1: This is the temperature and pressure at digitalYEWFLO mounted place.
Note 2: Contact with our service in case this is not carried out into the right statement.

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l After the output showed correctly, the indication goes down to zero at certain time.

When this problem occurred, the cause is suspected of deterioration of sensor sensitivity and turbulent of fluid flow due to coating on the shedder bar and flowmeter inner tube.

How to cope with this problem

1) Referring item 7.5 “Vortex Shedder Removal”, take out the Vortex Shedder bar and clean it.
2) If there is the coating on inner tube of the flowmeter, remove the flowmeter body from adjacent pipes and clean it.

No output is indicated when the fluid is flowing.

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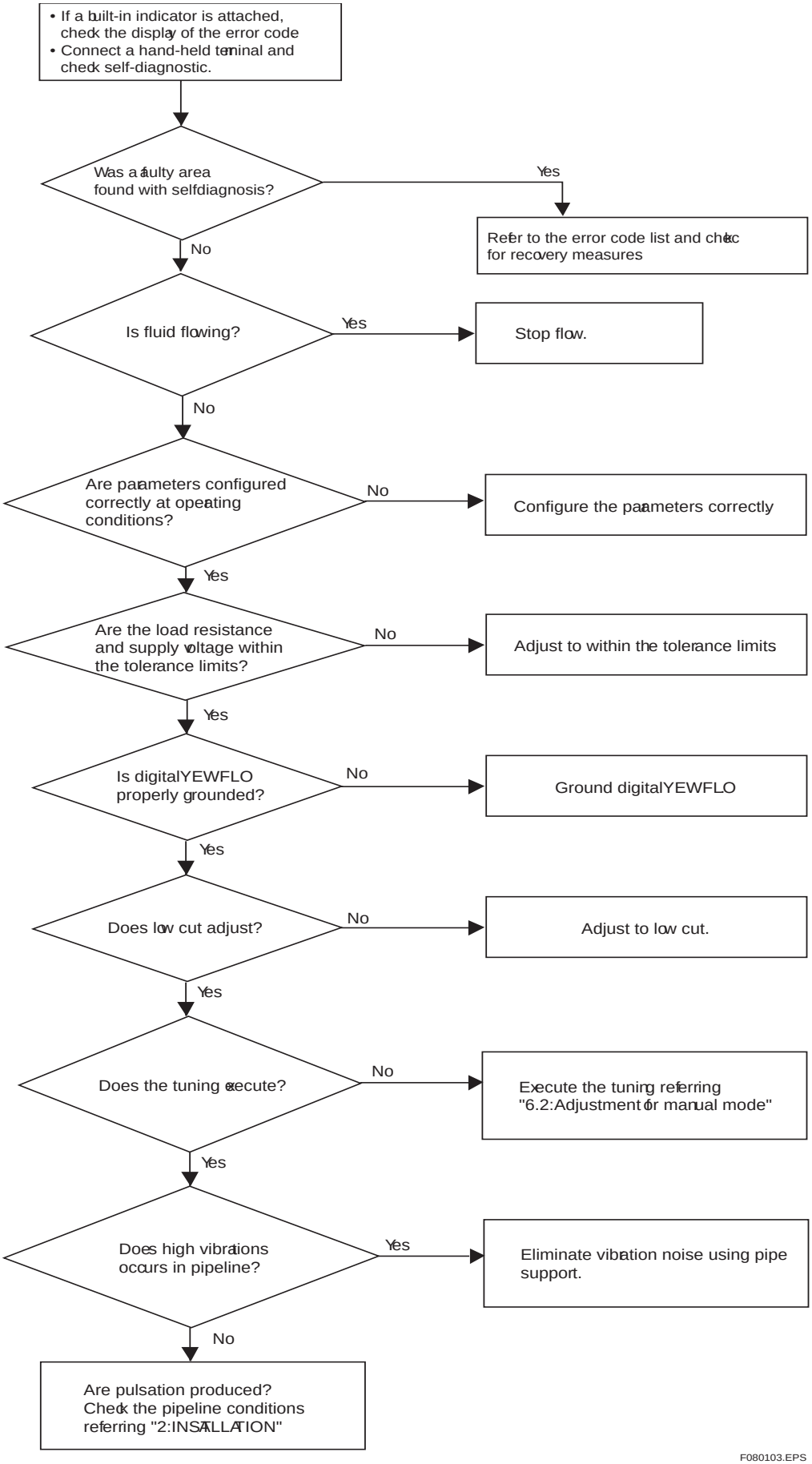
Output is indicated at zero flow.



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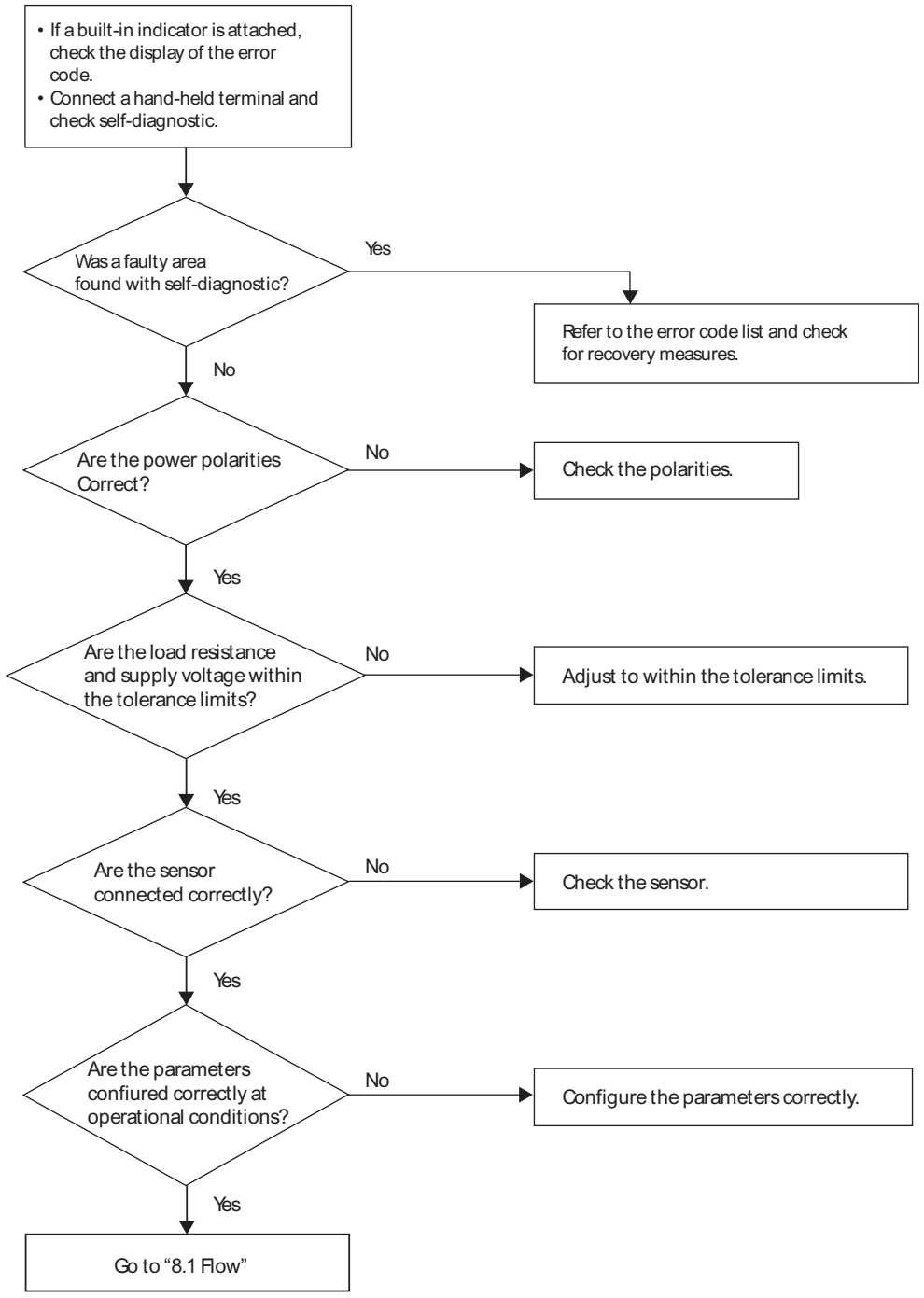
8.2 Flow (Only for /MV)

Start with this flow in case of /MV.


• If a built-in indicator is attached, check the display of the error code.
• Connect a hand-held terminal and check self-diagnostic.
Was a faulty area found with self-diagnostic?
Yes
Refer to the error code list and check for recovery measures.
No
Are the power polarities Correct?
No
Check the polarities.
Yes
Are the load resistance and supply voltage within the tolerance limits?
No
Adjust to within the tolerance limits.
Yes
Are the sensor connected correctly?
No
Check the sensor.
Yes
Are the parameters confiured correctly at operational conditions?
No
Configure the parameters correctly.
Yes
Go to “8.1 Flow”

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9. GENERAL DESCRIPTION

9.1 Outline

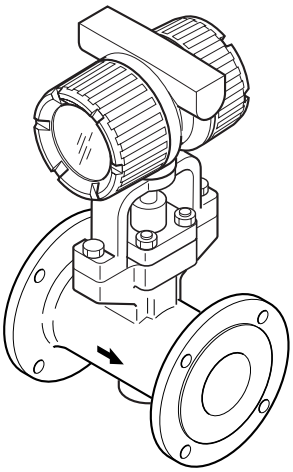
This vortex flowmeter measures liquid, gas and steam flow rates and converts them to a 4 to 20mA DC output or pulse, alarm, status output signal.

Since the converter is mounted independently from the flowmeter, it permits remote flow measurements of high temperature liquid, steam, etc.

Integral Type

The Integral Type Vortex Flowmeter (DY-A) has the converter with the flowmeter, and measures liquid, gas and steam flow rates and converts them to a 4 to 20mA DC output or pulse, alarm, status output signal.

Flange Type
(built-in indicator)



Wafer Type

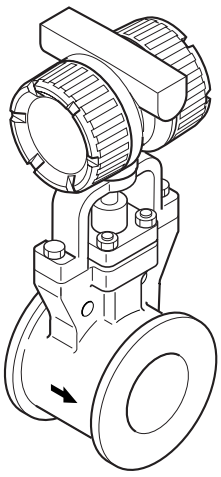


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Figure 9.1.1 External Views (Integral Type)

Remote Type

The Remote Converter Type Vortex Flowmeter (DY-N) is used with the Model DYA Vortex Flow Converter. A special cable (DYC) is used between these instruments.

Model DYA Vortex flow converter
(built-in indicator)

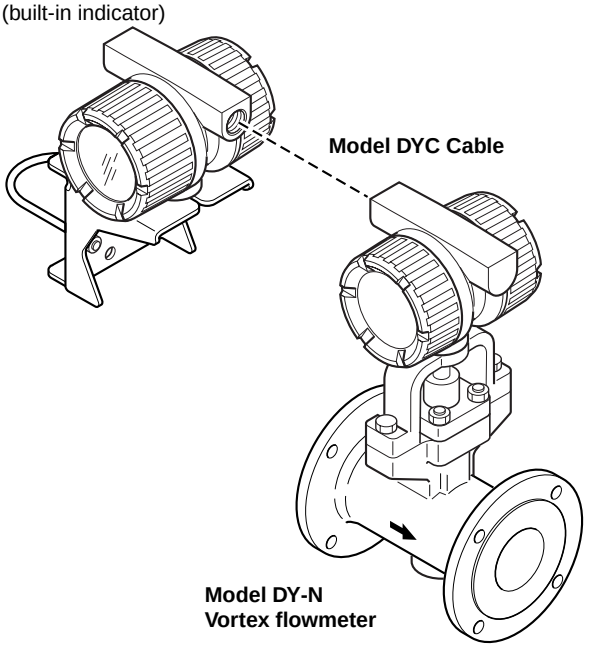

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Figure 9.1.2 External Views (Remote Type)

- **Name of a portion of the flowmeter (Example of the Wafer Type)**

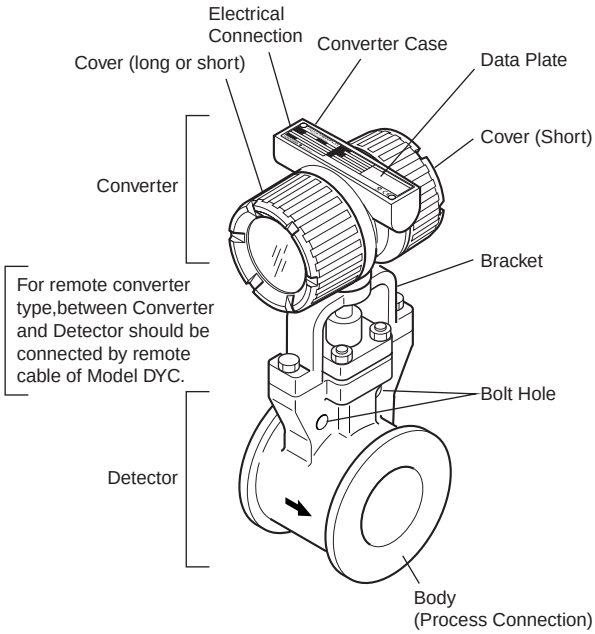

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Figure 9.1.3 Example of Name of portion

9.2 Standard Specifications

Refer to GS 01F06F01-01E for Fieldbus communication type, marked with “e”.

Performance Specifications

Fluid to be Measured :
Liquid, Gas, Steam (Avoid Multiphase Flow and Sticky Fluids)

Measuring Flow Rates :
Refer to Table 9.5.2

Accuracy : ±0.75% of Reading (Liquid)
±1% of Reading (Gas, Steam)
Refer to P9-15
For the Multi-Variable Type, refer to 9.4.2 term.

Repeatability : ± 0.2% of Reading

Calibration :
This flowmeter is factory-calibrated using a water flow.
Temperature and flow calibration by water flow when /MV is selected.

Normal Operating Condition

Process Temperature Range :
–29 to 260 °C (general)
–196 to 100 °C (Cryogenic Version:option)
–29 to 450 °C (High Process Temperature Version:option)
For the Multi-Variable Type, refer to 9.4.2 term.
Refer to Figure 1 for integral converter type.

Process Pressure Limit :
–0.1MPa (–1 kg/cm^2) to flange rating.

Ambient Temperature Range :
–29 to 85 °C (Remote type detector)
–40 to 85 °C (Remote type converter)
–29 to 85 °C (Integral type, refer to Figure 9.2.1)
–29 to 80 °C (Integral type with Indicator, refer to Figure 9.2.1)
–30 to 80 °C (Remote type converter with Indicator)

Ambient Humidity : 5 to 100% RH (at 40 °C)
(No Condensation)

Power Supply Voltage (e) :
without HART/BRAIN communication:
10.5 to 42 V DC for standard type
10.5 to 42 V DC for flame proof type /KF1
10.5 to 42 V DC for explosion proof type /FF1
10.5 to 30 V DC for intrinsically safe type /KS1, /FS1
10.5 to 30 V DC for non-incendive type /KN1
10.5 to 24 V DC for intrinsically safe FF type /KS25
10.5 to 32 V DC for intrisincally safe FF type /FS15
with HART/BRAIN communication:
Minimum supply voltage is 16.4 V
(Refer to Figure 9.2.2 ; Relationship Between Power Supply Voltage and Load Resistance)

Mechanical Specifications

Material (General Type):
Refer to Table 9.3.1
Body:
- CF8M casting stainless steel (equiv. 1.4408)
- 1.4552 casting stainless steel
- WCB casting carbon steel ASTM-A216WCB
- CW-12MW (equiv. Hastelloy C276)

Hastelloy is a registered trademark of Haynes International Inc.

Shedder bar:
- 1.4301 stainless steel
- 1.4517 duplex stainless steel
- DSD1-H duplex stainless steel
- DCS1 duplex stainless steel

DCS1 and DSD1-H are registered trademarks of Daido Tokusyu Steel Co.

Gasket: JIS SUS316 stainless steel with polytetrafluoroethylene coating.
Converter housing and case, cover:
Aluminum alloy

Coating Color:
Converter case, cover : Deep sea moss green (Munsell 0.6GY 3.1/2.0) (Polyurethane corrosion-resistant coating)

Protection:
IP67. NEMA 4X

Hazardous Area Classifications:
Refer to 9.4 Option Specifications.

Electrical Connection:
ANSI 1/2 NPT female,
ISO M20 x 1.5 female

Signal Cable:
Model DYC cable, used for remote detector and converter.
Max. length : 30 m.
Outer Sheath Material: Heat resisting polyethylene
Durable Temperature : –40 to 150 °C

Weight:
Refer to 9.6 External Dimension.

Mounting:
Integral type and Remote type detector :
Flange mounting or wafer mounting by flange adjacent to the pipeline.
Remote type converter : 2 inch pipe mounting.

Electrical Specifications

Note*: Pulse output, alarm output and status output use the common terminal, therefore these functions are not used simultaneously.

Output Signal (e) : Dual Output (Both Analog and Transistor contact output can be obtained simultaneously). In this case refer to “3: WIRING”.

Analog : 4 to 20 mA DC, 2-wire system.

Transistor Contact Output* :
Open collector, 3-wire system.
Pulse, alarm, status output are selected by parameter setting.
Contact rating: 30 V DC, 120 mA DC
Low level: 0 to 2 V DC. (refer to Figure 9.2.3)

Communication Requirement :

Communication Signal :
BRAIN or HART communication signal (superimposed on a 4 to 20 mA DC signal)

Conditions of Communication Line :

Load Resistance :
250 to 600 Ω(including cable resistance).
Refer to Figure 9.2.2

Supply Voltage :
16.4 to 42 V DC for digital communications BRAIN and HART protocols .(16.4 to 30 V DC for intrinsically safe type).
Refer to Figure 9.2.2

Space from other Power Line: 15cm or more (Parallel wiring should be avoided.)

BRAIN:

Communication Distance :
Up to 2 km, when polyethylene insulated PVC-sheathed cables (CEV cables) are used. Communication distance varies depending on type of cable used.
Load Capacitance: 0.22 µF or less
Load Inductance: 3.3 mH or less
Input Impedance of Receiver Connected to the Receiving Resistance:
10 kΩ or more at 2.4 kHz.

HART:

Communication Distance:
Up to 1.5km(0.9 mile), when using multiple twisted pair cables. Communication distance varies depending on type of cable used.
Cable Length for Specific Applications:
Use the following formula to determine cable length for specific applications.

$$L = \frac{65 \times 10^6}{(R \times C)} - \frac{(C_f + 10{,}000)}{C}$$

where:
L=length in meters.
R=resistance in ý (including barrier resistance)
C=cable capacitance in pF/m or pF/ft.
Cf= maximum shunt capacitance of receiving devices in pF/m or pF/ft.

NOTE: HART is a registered trademark of the HART Communication Foundation.

Functions:

Damping Time Constant :
0 to 99 Sec (63% response time)
Note: Delay time is 0.5 Sec.
Analog output circuit time constant is 0.3 Sec.

Pulse Output Function*:
Pulse output is selected from scaled pulse, unscaled pulse, frequency (number of pulses output per second at 100% of output).
Pulse frequency : Max 10 kHz
Duty cycles : Approx.50% (1:2 to 2:1)

Self -diagnostics and Alarm Output *:
In case alarm (over range output signal, EEPROM error, vibration noise, abnormal flow such as clogging, bubble) occurs, an alarm signal is output and indicated.
The alarm signal output goes from close(ON) to open(OFF) during alarming.

Status Output Function *:

Flow Switch:
In case flow rate decreases under the flow set value, a status signal is output.
Status signal output mode can reverse (ON/OFF) .

Analog Output Function:
Analog output is selected from flowrate temperature value when option code /MV is selected.

Data Security During Power Failure:
Data (parameter, totalizer value, etc) storage by EEPROM. No back-up battery required.

Correction:

Instrument Error Correction:
Vortex flowmeter instrument errors can be corrected by segment approximations.
Reynolds Number Correction:
Output error at Reynolds number 20000 or less is corrected by using five-break-point line-segment approximation.
Gas Expansion Correction:
When measuring a compressibility gas and steam, this expansion factor is useful to correct the error at high velocity of flow (35m/s or more).

Down-scale or Up-scale burn out.
In case a CPU or EEPROM failure occurs, flow meter output the signal of Up-scale (21.6 mA or more).
Up-scale or Down-scale (3.6 mA or less) is user-selectable through the fail mode alarm jumper.

Indicator:
Flow rate (% or engineering units) or temperature value and totalizer can be indicated simultaneously.
Short message for self diagnostics indicates.
Local parameter setting can be operated by key switches.
In mounting direction, the right and left 90° is rotatable.

EMC Conformity Standards:
EN61326
AS/NZS CIS PR11
Note: For remote converter type, the signal cable should be used with the metal conduit.

Pressure Equipment Directive:
Notified Body Identification Number 0038
Module H

MODEL	DN (mm)*	PS (MPa)*	PS * DN (MPa*mm)	CATEGORY**
DY015	15	42	630	Article 3,*** Paragraph 3
DY025	25	42	1050	Article 3,*** Paragraph 3
DY040	40	42	1680	II
DY050	50	42	2100	II
DY080	80	42	3360	II
DY100	100	42	4200	II
DY150	150	42	6300	III
DY200	200	42	8400	III
DY250	250	42	10500	III
DY300	300	42	12600	III

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* PS: Maximum allowable pressure for Flow tube,
DN: Nominal size

** Refered to Table 6 coverd by ANNEX II of EC Directive 97/23/EC, Pressure Equipment Directive PED

*** DY015 and DY025 are not regulated by PED.

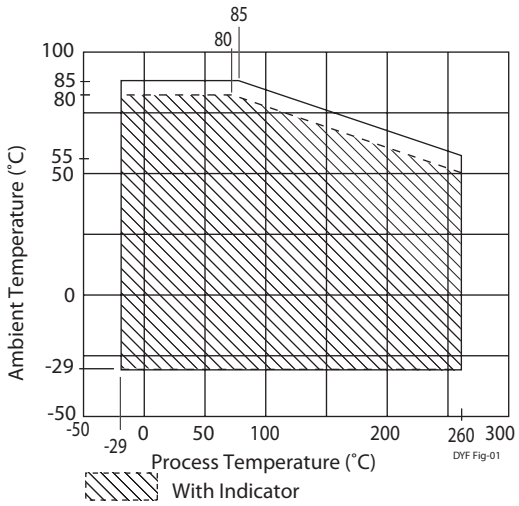

Figure 9.2.1 Ambient Temperature limit (Integral Type)

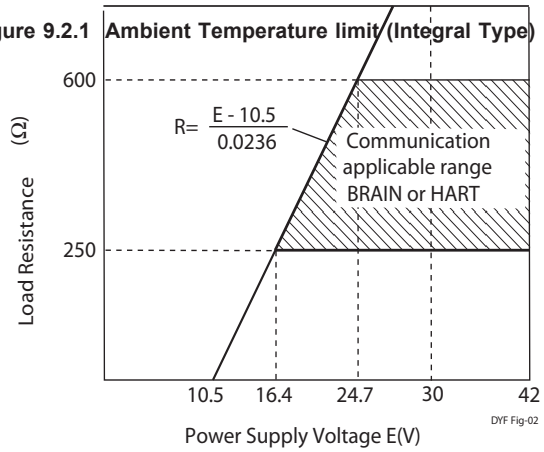

Figure 9.2.2 Relationship Between Power Supply and Load Resistance

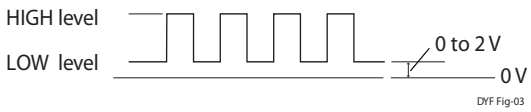

Figure 9.2.3 High and low level (Pulse output)

9.3 Model and Suffix Codes

DY Vortex Flowmeter (Integral Type, Remote type detector)

Model	Suffix Codes	Description
DY015		Size 15 mm (½ inch)
DY025		Size 25 mm (1 inch)
DY040		Size 40 mm (1½ inch)
DY050		Size 50 mm (2 inch)
DY080		Size 80 mm (3 inch)
DY100		Size 100 mm (4 inch)
DY150		Size 150 mm (6 inch)
DY200		Size 200 mm (8 inch)
DY250		Size 250 mm (10 inch)
DY300		Size 300 mm (12 inch)
Output Signal /Communication *1*12	-D	4 to 20 mA DC, Pulse, BRAIN Communication
	-E	4 to 20 mA DC, Pulse, HART Communication
	-F	Digital communication (FOUNDATION Fieldbus protocol)
	-N	Remote type detector
Body Material *2*14	B	Stainless steel (CF8M / equiv. 1..4408) *3
	C	Stainless steel (1. 4552)
	W	Carbon steel (WCB) *15
	X	Others
Shedder bar Material *4	L	Standard
	X	Others
Process Connection *3 *5	AA1	ANSI Class 150 Wafer
	AA2	ANSI Class 300 Wafer
	AA4	ANSI Class 600 Wafer
	AD1	DIN PN16 Wafer
	AD2	DIN PN16 Wafer
	AD3	DIN PN25 Wafer
	AD4	DIN PN40 Wafer
RF: Raised Face SF:Smooth Finish *16 RJ:Ring Joint	BA1	ANSI Class 150 Flange (RF)
	BA2	ANSI Class 300 Flange (RF)
	BA4	ANSI Class 600 Flange (RF)
	BA5	ANSI Class 900 Flange (RF)
	BS1	ANSI Class 150 Flange (RF, SF)
	BS2	ANSI Class 300 Flange (RF, SF)
	BS4	ANSI Class 600 Flange (RF, SF)
	BS5	ANSI Class 900 Flange (RF, SF)
	BD1	DIN PN10 Flange (RF)
	BD2	DIN PN16 Flange (RF)
	BD3	DIN PN25 Flange (RF)
	BD4	DIN PN40 Flange (RF)
	BD5	DIN PN64 Flange (RF)
	BD6	DIN PN100 Flange (RF)
	BD7	DIN PN160 Flange (RF)
	CA4	ANSI Class 600 Flange (RJ)
	CA5	ANSI Class 900 Flange (RJ)
Electrical Connection *11	-2	ANSI ½ NPT Female *6
	-4	ISO M20 x1.5 Female
Indicator *7	D	With Indicator
	N	None Indicator, Remote type detector
Options	/□	Refer to Option Specifications

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DYA Vortex Flowmeter Converter (Remote Type)

Model	Suffix Code	Description
DYA		Vortex Flowmeter Converter (Remote Type)
Output Signal /Communication *1 *13	-D	4 to 20 mA DC, Pulse BRAIN Communication
	-E	4 to 20 mA DC, Pulse HART Communication
	-F	Digital communication (FOUNDATION Fieldbus protocol)
Electrical Connection *11	2	ANSI 1/2 NPT Female *6
	4	ISO M20 ×1.5 Female
Indicator	D	With Indicator
	N	None Indicator
Options	/□	Refer to Option Specifications

DYC Signal Cable

Model	Suffix Code	Description
DYC		Signal Cable
Cable End	-0	Without End finish *8
	-1	With End finish
Cable Length	-05	5 m
	-10	10 m
	-15	15 m
	-20	20 m
	-25	25 m
	-30	30 m
	-□□	□□ m *9
Options	/C□	Cable End Finish Parts *10
	/MV	Signal cable for temperature sensor type *13

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* 1 : Nominal size, Fluid (Liquid, Gas, Steam), Density, Viscosity, Pressure, Temperature, Flow range, Parameters are set at the factory before shipment.
* 2 : Refer to Table 1.
In case of /NC or /HY or /HT or /LT, select X (others).
The body material (CF8M or 1.4552 or WCB) varies according to each sales area. Please contact YOKOGAWA sales person.
* 3 : In case of B (CF8M), the process connection is available for ANSI (AA1 to 4, BA1 to 5, CA4 to 5) and DIN (AD1 to AD4, BD1 to 4).
* 4 : Refer to Table 1.
In case of /NC or /HY or /HT or /LT, select X (others).
The shedder bar material (1.4517 (1.4301 for DN15), DCS1 (15mm is DSD1-H)) varies according to each sales area. Please contact YOKOGAWA sales person.
* 5 : Refer to Table 2.
* 6 : In case of /FF1, the screw length is deeper than ANSI standard for 0.5 to 3.5 threads.
* 7 : Indicator is not available for remote type detector.
* 8 : One set of end finish part is attached.
* 9 : Fill in two digit figure per 5 m unit (e.g. 35 m, 40 m etc.). The cable can be cut to required length within 30 m at customer side. In this case, select Cable End Code [-0].
*10: An entered digit figure shows required set quantity. Only for Cable End Code [-0]
*11: In case of an explosion protect type, it depends for an electrical connection on the kind of an explosion protect type. Refer to " OPTION SPECIFICATION (HAZARDOUS AREA CLASSIFICATIONS)"
*12: For FOUNDATION Fieldbus protocol, refer to GS 01F06F01-01E. For Fieldbus communication type, there are no setting keys on the display board.
*13: Essentially, DYA- □□□ /MV and DY □□□ -N***/MV should be combined.
*14: Users must consider the characteristics of selected wetted parts material and the influence of process fluids. The use of inappropriate materials can result in the leakage of corrosive process fluids and cause injury to personnel and/or damage to plant facilities. It is also possible that the instrument itself can be damaged and that fragments from the instrument can contaminate the user's process fluids.
Be very careful with highly corrosive process fluids such as hydrochloric acid, sulfuric acid, hydrogen sulfide, sodium hypochlorite, and high-temperature steam (150 °C [302 °F] or above). Contact Yokogawa for detailed information of the wetted parts material.
*15: Body material carbon steel (WCB): Due to wet calibration DY will always generate superficial rust in the flow path and on the surface during shipping to customer site. The superficial oxidation has no influence on the accuracy of the flowmeter. Unfortunately the oxidation can not be avoided with carbon steel body material.
*16: Flange surface in standard roughness without grooves.

Table 1 Body, Shedder bar, Gasket Material

Option Item (Note 1)	Option Code (Note 1)	Material			Process Connection			
		Body (Note 2)	Shedder bar (Note 3)	Gasket	Wafer Type Model Code	Flange Type Model Code (Note 12)		
General (REFERENCE) (Note 11)	——	CF8M / 1.4408 1.4552 WCB (Note 11) (Note 7+8+9)	1.4517 (1.4301) DCS1 (DSDH-1)	(Note 4)	DY015 up to DY100	DY015 up to DY300	DY025-/R1 up to DY200-/R1	DY040-/R2 up to DY200-/R2
Compliance with NACE (Note 10)	NC	1.4552 CF8M (Note 8+14)	(Note 5)	(Note 4)	DY015 up to DY100	DY015 up to DY200	DY025-/R1 up to DY150-/R1	DY040-/R2 up to DY200-/R2
Anti-corrosion Version II	HY	CF8M / 1.4408 1.4552 WCB (Note 7+9+14)	(Note 5)	(Note 4)	DY015 up to DY100	DY015 up to DY100	DY025-/R1 up to DY150-/R1	DY040-/R2 up to DY200-/R2
Anti-corrosion Version III (Note 10)	HC	CW-12MW (Note 13)	(Note 5)	(Note 4)	DY015 up to DY100	DY015 up to DY200	—	—
High Process Temperature Version (Note 6)	HT	CF8M / 1.4408 1.4552 WCB (Note 7+8+9+14)	(Note 5)	JIS SUS316 stainless steel plated with silver	DY025 up to DY100	DY025 up to DY200	DY040-/R1 up to DY200-/R1	DY050-/R2 up to DY200-/R2
Cryogenic Version (Note 6)	LT	1.4308 1.4552 equiv. SCS13	(Note 5)	(Note 4)	DY015 up to DY100	DY015 up to DY100	—	—
Multi Variable	MV	1.4552 CF8M / 1.4408 WCB (Note 7+8+9+14)	DCS1	(Note 4)	DY025 up to DY100	DY025 up to DY100	DY025-/R1 up to DY200-/R1	DY025-/R1 up to DY200-/R1

(Note 1) Refer to item "Option Specifications"
(Note 2) In case of /NC or /HY or /HT or /LT in combination with body material "B", select body material code [-X]. The body material CF8M or 1.4552 or WCB varies according to each sales area. Please contact YOKOGAWA sales person.
(Note 3) In case of /NC or /HY or /HT or /LT, select shedder bar material code [-X]. The shedder bar material (1.4517 (1.4301 for DN15) or DCS1 (15mm is DSD1-H)) varies according to each sales area. Please contact YOKOGAWA sales person.
(Note 4) JIS SUS316 stainless steel with polytetrafluoroethylene (Teflon) coating
(Note 5) DY025 (DY040-/R1) to DY200 (DY200-/R1): CW-12MW (equiv. Hastelloy C)
DY015 (DY025-/R1): N10276 (equiv. Hastelloy C)
(Note 6) Remote type only. DYA converter and DYC cable should be used in combination.
(Note 7) Body material WCB only flange type 80 mm to 200 mm, but not for BA5, BD7, CA4, CA5
(Note 8) Process connection BA5, BD7,CA4,CA5 and DY150-BA4 only with body material CF8M.
(Note 9) Carbon steel (WCB) and CF8M / 1.4408 body material not available for wafer.
(Note 10) Material Conformity in accordance with NACE-MR0175-2003, EN-ISO 15156-3 and NACE-MR0103-2005.
(Note 11) Shedder material 1.4517 (1.4301 for DN15) available in combination with body material CF8M, 1.4552 or WCB.
Shedder material DCS1 (DSDH-1 for DN15) available in combination with body material CF8M.
DY250 and DY300 only available with body material CF8M.
(Note12) Reduced bore types (Option /R1 and /R2) available only with body material CF8M.
(Note13) Body material CW-12MW only available for DY015 to DY100 with AA1, AA2, AA4 and DY015 to DY200 with BA1, BA2. Please select body material code [-X].
(Note14) In combination with option /HC, the body material is CW-12MW.

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Table 2 Flowmeter Selection Guide

Process Connection	Wafer		Flange (Raised Face)				Flange (Ring Joint)		Flange (Raised Face, Smooth Finish)			
	Suffix Code	Model Code	Suffix Code	Model Code			Suffix Code	Model Code	Suffix Code	Model Code		
ANSI Class 150	AA1	DY015 up to DY100	BA1	DY015 up to DY300	DY025-/R1 up to DY200-/R1	DY040-/R2 up to DY200-/R2	—	—	BS1	DY015 up to DY300	DY025-/R1 up to DY200-/R1	DY040-/R2 up to DY200-/R2
ANSI Class 300	AA2	DY015 up to DY100	BA2	DY015 up to DY300	DY025-/R1 up to DY200-/R1	DY040-/R2 up to DY200-/R2	—	—	BS2	DY015 up to DY300	DY025-/R1 up to DY200-/R1	DY040-/R2 up to DY200-/R2
ANSI Class 600	AA4	DY015 up to DY100	BA4	DY015 up to DY200			CA4	DY015 up to DY200	BS4	DY015 up to DY200		
ANSI Class 900	—	—	BA5	DY015 up to DY200			CA5	DY015 up to DY200	BS5	DY015 up to DY100		
DIN PN 10	AD1	DY015 up to DY100	BD1	DY015 up to DY200			—	—	—	—		
DIN PN 16	AD2	DY015 up to DY100	BD2	DY015 up to DY200			—	—	—	—		
DIN PN 25	AD3	DY015 up to DY100	BD3	DY015 up to DY200			—	—	—	—		
DIN PN 40	AD4	DY015 up to DY100	BD4	DY015 up to DY200			—	—	—	—		
DIN PN 64	—	—	BD5	DY050 up to DY150			—	—	—	—		
DIN PN 100	—	—	BD6	DY015 up to DY150			—	—	—	—		
DIN PN 160	—	—	BD7	DY015 up to DY100			—	—	—	—		

(Note)
• ANSI standardized types are worked by serration finishing except the Smooth Finish type.
• Refer to "OPTION REDUCED BORE TYPE (/R1, /R2)" (P.9-12), when you select reduced bore type (/R1, /R2).

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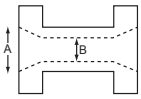
9.4 Option Specifications

9.4.1 Option Specifications

Item	Specification	Applicable Model	Code	Body Material			
				B	C	W	X
Multi-Variable Type (Note 5)	Built in Temperature sensor (Pt 1000) in vortex shedder bar.	DY / DYA	MV	●	●	●	
Reduced bore type (Note 8) See P.9-12 	Integrated and welded construction with concentric reduced bore piping. R1 : Detector size (B) is one meter body size down of digitalYEWFLO to flange pipe size (A).	DY	R1	●			
	R2 : Detector size (B) is two meter body size down of digitalYEWFLO to flange pipe size (A).		R2	●			
Stainless Steel Tag Plate (Note 1)	SUS304 tag plate, hung on converter case.	DY / DYA	SCT	●	●	●	●
Stainless Steel Bolt & Nut Assembly	SUS304 bolt/nut assembly. Used when a wafer type is installed.	DY Wafer Type	BL	●	●		●
Hydrostatic / Pneumatic Test Certificate (Note 14)	Test pressure value is in accordance with Table 4. Test time: 10 min. Available for the general type. Test medium: Air, Nitrogen or Water.	DY	T01	●	●	●	●
Hydrostatic Test Certificate (Note 14)	Test pressure value is in accordance with Table 4. Test time: 10 min. Available for the general type. Test medium: Water.	DY	T02	●			●
Calibration Certificate	Level 2 Declaration and Calibration Equipment List	DY / DYA	L2	●	●	●	●
	Level 3 Declaration and Primary Standard List	DY / DYA	L3	●	●	●	●
	Level 4 Declaration and YOKOGAWA Measuring Instruments Control System	DY / DYA	L4	●	●	●	●
User specified calibration (Note 10)	A flow test at five user specified flow values is made with water after the standard calibration. The flow values are limited by minimum flow acc. table 8 and max. flow velocity of 5.5 m/s.	DY	SC		●	●	●
Degrease Treatment (Note 2)	Degrease cleansing treatment.	DY	K1	●			●
Degrease Treatment ASTM (Note 10)	Degreasing Treatment of wetted surfaces acc. ASTM.	DY	DEG		●		●
Epoxy Coating	Epoxy coating for meter cover and case.	DY / DYA	X1	●	●	●	●
Pilling up coating to keep off corrosion	Epoxy and Polyurethane coating for the purpose of corrosion - proof improvement; salt damage, alkali, climate and acidity	DY/DYA	X2	●	●	●	●
High Process Temperature Version	For Liquid and Steam (NOT for Gas) This specification temperature is from -29 to +450 °C Refer to Table 1 Refer to Table 5 for minimum velocity. In case of another size, please contact to YOKOGAWA sales person.	DY***-N	HT		●	●	●
Cryogenic Version	This specification temperature is from -196 to +100 °C Refer to Table 1 In case of another size, please contact to YOKOGAWA sales person.	DY***-N	LT		●		●
Compliance with NACE (Note 9)	Compliance with NACE. Refer to Table 1.	DY	NC		●		●
Anti-corrosion Version II (Note 10)	Anti-corrosion Version II. Refer to Table 1.	DY	HY		●	●	●
Anti-corrosion Version III (Note 10)	Anti-corrosion Version III. Refer to Table 1.	DY	HC				●
Compliance with NAMUR (Note 6)	Compliance with NAMUR43. Current signal for measurement is 4 mA up to 20.5 mA. Set output 3.6 mA or less when burn-out occurred.	DY / DYA	NM	●	●	●	●
ESD compliance according Namur (Note 10) (Note 12)	Internal protection covers for ESD enhancement	DY / DYA	ESD		●	●	●
Down-scale burn-out in CPU or EEPROM failure (Note 3)	Current signal for measurement is 4 mA up to 21.6 mA. Set output to 3.6 mA or less when burn-out occurred.	DY***-D,E / DYA	C1	●	●	●	●
Lightning Protector	There is an arrester inside converter for power supply line. Maximum power supply voltage: 30 V DC	DY***-D,E / DYA	A	●	●	●	●
Stainless Steel Bracket for Remote Converter (DYA)	The bracket material for remote converter type (DYA) is SUS304.	DYA	SB	●	●	●	●
Converter Installing Direction 180 Change (Note 4)	Converter installing direction 180° change inversely when shipped.	DY	CRC	●	●	●	●
Smooth flange finish (Note 10) (Note 13)	Finish of flange facing Ra 3.2 ... 6.3. Refer to Figure 6.	DY	ASF		●	●	●
Rough DIN Flange (Note 10)	Finish of DIN Flange Ra 6.3 ... 25.	DY	DFC		●	●	●
Smooth DIN Flange (Note 10)	Finish of DIN Flange Ra 0.8 ...1.6.	DY	DFE		●	●	●

DYF Tab-07-1

Item	Specification		Applicable Model	Code	Body Material B	C	W	X
Material certificates: Mill sheets (Note 15)	Each certificate to be attached produced by the vendors.		DY					
	Item to be specified	1. Meterbody		M01	●	●	●	●
		1. Meterbody, 2. Shedder bar		M02	●	●	●	●
		1. Meterbody, 2. Shedder bar, 3. Bottom plug		M03	●	●	●	●
		1. Meterbody, 2. Shedder bar, 3. Bottom plug, 4. Welding rod		M04	●	●	●	●
Material certificates: 3.1	3.1 certificate which is attached according to EN10204. Each certificate which is attached produced by the vendors.		DY					
	Item to be specified	1. Meterbody		E01	●	●	●	●
		1. Meterbody, 2. Shedder bar		E02	●	●	●	●
		1. Meterbody, 2. Shedder bar, 3. Bottom plug		E03	●	●	●	●
		1. Meterbody, 2. Shedder bar, 3. Bottom plug, 4. Welding rod		E04	●	●	●	●
PAMI test certificate	Positive Material Identification certificate to be attached for the main 3 chemical components of specified materials. Each certificate to be attached.		DY					
	Item to be specified	1. Meterbody		PM1	●	●	●	●
		1. Meterbody, 2. Shedder bar		PM2	●	●	●	●
		1. Meterbody, 2. Shedder bar, 3. Plug		PM3		●	●	●
		1. Meterbody, 2. Shedder bar, 3. Plug, 4. Plate		PM4		●	●	●
ASME welding documents submission	1. Welder/Welding Operator Performance Qualification (or Welder Qualification Record) 2. Welding Procedure Specification (WPS) 3. Procedure Qualification Record (PQR) Each certificate to be attached. The customer's name and job name to be specified when ordered.		DY	WP	●	●	●	●
	Item to be specified	1. Welded portion for the bottom plug 2. Welded portion for the flange in case of the welding construction						
Dye Penetrant test certificate	Dye Penetrant test certificate for the welded portion to be attached. Each certificate to be attached.		DY	PT	●	●	●	●
	Item to be specified	1. Welded portion for the bottom plug 2. Welded portion for the flange in case of the welding construction						
Final product certificate (Note 10) (Note 11)	- Final Product Certificates (FPC) acc. to EN 10204:2004 - Certificate of marking transfer - material Certificates acc. DIN EN 10204:2004 – 3.1 for all materials of body, shedder bar, plug and plate and welding rod. - Test Report acc. to DIN EN 10204:2004 - 2.2 - WQC, WPS, PQR for plug welding. - Inspection Report to Dye-Penetration-Test acc. to EN 571 for plug welding.		DY	FPC		●	●	●

(Note 1) When /SCT is not chosen, the specified Tag Number is engraved on the data plate.
When /SCT is chosen, the specified Tag Number is engraved on the data plate and stainless tag plate. The limitation of characters for Tag Number is, for BRAIN communication or name plate, stainles steel tag plate: 16 characters, and for HART communication: 8 characters.
(Note 2) There is a case that calibration water should stay in the meter tube. So this is not degrease treatment in the strict sense.
(Note 3) The output is set to 3.6 mA or less (General type is set to 21.6 mA or more at shipping).
(Note 4) When /CRC is chosen, the electrical connection is turned to a downstream side.
(Note 5) Refer to "OPTION MULTI-VARIABLE (BUILD IN TEMPERATURE SENSOR) TYPE (/MV)" (p.9-11)
In case of Remote type detector (DY***-N), select "/MV" both DY and DYA.
(Note 6) /NM can not be combined with Remote type detector (DY***-N).
(Note 8) • Cryogenic version (/LT) is not available.
• High process temperature version (/HT) and Multi-variable type (/MV) for DY025/R1 and DY040/R2 are not available.
• Flange type only and available process connections are ANSI150, 300 (BA1,BA2,BS1,BS2).
• Flange piping size (A) means "DY***-" nominal size.
(Note 9) Limitations for the usage of wetted part materials according to NACE-MR0175-2003
(Note 10) Only available for DY015 to DY200; not available for flange type BS1 ... 5, CA4, CA5.
(Note 11) Accumulation of options /E04, /WP, /PT
(Note 12) Option /ESD is not possible / not necessary for units without display or with Foundation Fieldbus Communication.
(Note 13) Only available for DY015 to DY100 with AA1, AA2, AA4 and DY015 to DY200 with BA1, BA2, BA4, BA5.
(Note 14) In the Calibration Certificate is the confirmation ("OK") included about the pressure test which was done with positive result.
(Note 15) Certificates may be substituted by Material Certificates acc. EN 10204-3.1, depending on material supplier.

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9.4.2 OPTION SPECIFICATIONS (For Explosion Protected Type)

Item	Specification	Code
ATEX (KEMA)	ATEX (KEMA) Flame proof Approval Type of protection : EExd IIC T6...T1 (Integral Type Flowmeter and Remote Type Flowmeter) EExd IIC T6 (Remote Type Converter) Groups : Group II Category : Category 2G Temperature Class : T6...T1 (Integral Type Flowmeter and Remote Type Flowmeter) T6 (Remote Type Converter) Process temp.: T6; 85 °C, T5;100 °C; T4;135 C; T3;200 °C;T2;300 °C; T1;450 °C (Use /HT version above 260 °C) Degree of Protection of Enclosure : IP67 Tamb.(Integral Type Flowmeter and Remote Type Flowmeter) : –29 to +60 °C Tamb.(Remote Type Converter) : –30 to +60 °C Tamb.(Integral Type Flowmeter with indicator) : –29 to +60 °C Tamb.(Remote Type Converter with indicator) : –30 to +60 °C Ambient Humidity : 0 to 100 % RH Maximum working Pressure : 42 MPa Coating of Enclosure : Epoxy resin coating or Polyurethane resin coating. Electrical Connection : ANSI 1/2 NPT female, ISO M20 ´ 1.5 female.	KF1
	ATEX (KEMA) Intrinsically safe Approval (Note 1) Type of protection : EEx ia IIC T4...T1 (Integral Type Flowmeter and Remote Type Flowmeter) EEx ia IIC T4 (Remote Type Converter) Groups : II Category : 1G Maximum Working Pressure : 42 MPa Tamb.(Integral Type Flowmeter) : –29 to +60 °C Tamb.(Remote Type Flowmeter) : –29 to +80 °C Tamb.(Remote Type Converter) : –40 to +60 °C Ambient Humidity : 0 to 100%RH (No condensation) Process temp. : T4;135 °C; T3;200 °C; T2;300 °C; T1; 450 °C (Use /HT version above 260 °C) For connection to certified Intrinsically Safe circuit with Signal/Supply and Pulse circuit of Integral Type Flowmeter and Remote Type Converter Ui=30 Vdc, Ii=165 mAdc, Pi=0.9 W, Ci=6n F, Li=0.15 mH Connect sensor circuit of DYA and DY-N(/HT) Maximum cable capacitance:160 nF Electrical connection : ANSI 1/2NPT female, ISO M20 x 1.5 female.	KS1
	CENELEC ATEX(KEMA) Intrinsically Safe Approval (Note 3) Type of Protection: EEx ia IIC T4...T1 (Integral Type Flowmeter and Remote Type Flowmeter) EEx ia IIC T4 (Remote Type Converter) Groups: II Category: 1G Maximum Working Pressure: 42MPa Tamb. (Integral Type Flowmeter): –29 to +60 °C Tamb. (Remote Type Flowmeter): –29 to +80 °C Tamb. (Remote Type Converter): –40 to +60 °C Ambient Humidity: 0 to 100 %RH (No condensation) Process Temp.: T4; 135 °C, T3; 200 °C, T2; 300 °C, T1;450 °C (Use /HT version above 260 °C) For connection to certified Intrinsically Safe circuit with Supply circuit of Integral Type Flowmeter and Remote Type Converter: Ratings 1 (Entity): Ui=24 V, Ii=250 mA, Pi=1.2 W, Ci=1.76 nF, Li=0 Ratings 2 (FISCO): Ui=17.5 V, Ii=380 mA, Pi=5.32 W, Ci=1.76 nF, Li=0 Connect sensor circuit of DYA and DY-N (/HT) Electrical Connection: ANSI 1/2NPT female, ISO M20 × 1.5 female	KS25
ATEX Type "n" protection	ATEX Type "n" approval (Note 2) Type of protection : EEx nL IIC T4... T1 (Integral Type Flowmeter and Remote Type Flowmeter) EEx nL IIC T4 (Remote Type Converter) Group : II Category : 3G Maximum Working Pressure : 42MPa Tamb. : –29 to +60 °C (Integral Type Flowmeter and Remote Type Converter) Tamb. : –29 to +80 °C (Remote Type Flowmeter) Ambient Humidity : 0 to 100 %RH (No condensation) Process temp.:T4;135 °C; T3;200 °C; T2(*);300 °C; T1(*); 450 °C (*: Use /HT version above 260 °C) Degree of protection of enclosure : IP67 Maximum cable capacitance: 160 nF Electrical connection : ANSI 1/2NPT, ISO M20 x 1.5 female.	KN1

DYF Tab-05-02.EPS

(Note 1) For intrinsically safe approval, use the barrier certified by the testing laboratories (BARD-400 is not applicable).
(Note 2) "n" type = non incendive device
(Note 3) Please refer also to GS 01F06F01-01E for Foundation Fieldbus Communication Type

OPTION SPECIFICATIONS (For Explosion Protected Type) continued

Item	Specification	Code
Factory Mutual (FM)	FM Explosion proof Approval Type of Protection : Explosion proof for Class I, Division 1, Groups A, B, C and D; Dust-ignitionproof Class II/III, Division 1, Groups E, F, and G. "SEAL ALL CONDUITS WITHIN 18 INCHES." "WHEN INSTALLED IN DIV.2, SEALS NOT REQUIRED." Enclosure Rating : NEMA TYPE 4X Temperature Code : T6 Ambient Temperature : –29 to 60 °C (Integral Type Flowmeter and Remote Type Flowmeter) –40 to 60 °C (Remote Type Converter) Ambient Humidity : 0 to 100 % RH Maximum Working Pressure : 16 MPa (DY015 to DY200) 5 MPa (DY250 and DY300) Coating of Enclosure : Epoxy resin coating or Polyurethane resin coating. Electrical Connection : ANSI 1/2NPT female	FF1
	FM Intrinsically safe Approval (Note 1) Type of Protection : Intrinsically Safe for Class I, II, III, DIV.1, Groups A, B, C, D, E, F and G, T4, and Class I, Zone 0, AEx ia IIC T4 Nonincendive for Class I, II, Div.2, Groups A, B, C, D, F and G, Class III, DIV.1, T4, and Class I, Zone 2, Groups IIC, T4 Ambient Temperature : –29 to +60 °C (Integral Type Flowmeter) –29 to +80 °C (Remote Type Flowmeter) –40 to +60 °C (Remote Type Converter) Ambient Humidity : 0 to 100 % RH (No condensation) Indoors and Outdoors : NEMA TYPE 4X Electrical Parameter : Vmax=30 Vdc, Imax=165 mAdc, Pi=0.9 W, Ci=12 nF, Li=0.15 mH Electrical Connection : ANSI 1/2NPT female	FS1
	FM Intrinsically Safe Approval (Note 2) Type of Protection : Intrinsically Safe for Class I, II, III, DIV.1, Groups A, B, C, D, E, F and G, T4, and Class I, Zone 0, AEx ia IIC T4 Nonincendive for Class I, II, Div.2, Groups A, B, C, D, F and G, Class III, DIV.1, T4 Ambient Temperature : –29 to +60 °C (Integral Type Flowmeter) –29 to +80 °C (Remote Type Flowmeter) –40 to +60 °C (Remote Type Converter) Ambient Humidity : 0 to 100 % RH (No condensation) Indoors and Outdoors : NEMA TYPE 4X Electrical Parameters : Intrinsically Safe [Entity] Vmax=24 V, Imax=250 mA, Pi=1.2 W, Ci=1.7 6nF, Li=0 [FISCO] Vmax=17.5 V, Imax=380 mA, Pi=5.32 W, Ci=1.76 nF, Li=0 Nonincendive Vmax=32 V, Ci=1.76 nF, Li=0 Electrical Connection : ANSI 1/2NPT female	FS15

DYFTab-05-01.EPS

(Note 1) For intrinsically safe approval, use the barrier certified by the testing laboratories (BARD-400 is not applicable).
(Note 2) Please refer also to GS 01F06F01-01E for Foundation Fieldbus Communication Type

9.4.3 OPTION MULTI-VARIABLE (BUILD IN TEMPERATURE SENSOR) TYPE (/MV) (Note 1)

This options is the same as standard specification except the following items.

		Multi-variable Type					Standard Type
Size		Wafer Type	25 mm to 100 mm				15 mm to 100 mm
		Flange Type	25 mm to 200 mm				15 mm to 200 mm
Temperature Function		Display indication and output	Temperature, Mass Flow, Volumetric Flow, Normalized Volumetric Flow				
Fluid		Liquid, Gas Saturated Steam Superheated Steam	Saturated Steam	Superheated Steam	Gas	Liquid	Liquid, Gas Saturated Steam Superheated Steam
Temperature Range		–29 to 260 °C	100 to 260 °C	100 to 260 °C	–29 to 260 °C	–29 to 260 °C	–29 to 260 °C
Accuracy (Note 2)	Mass Flow		Refer to Table 3				
	Temperature		±0.5 % OF RATE	±1 % OF RATE	±1 % (Less than 100°C) ±1 % OF RATE (100 °C or more)	±0.5 °C (Less than 100 °C) ±0.5 % OF RATE (100 °C or more)	
Temperature Response (50 % response)		60 s (Churning Underwater)					
Mass Flow Calculation Method			Density Calculation (Note 3)	Density Calculation (Constant pressure is assumed) (Note 4)	Temp.-Pressure Correction (Constant pressure is assumed) (Note 5)	Density change Calculation (Note 6)	
Output	Current Output	Temperature, Mass Flow, Volumetric Flow, Normalized Volumetric Flow (Note 7)					Only for Flow Rate
	Pulse Output	Mass Units , Volumertric Units, Normalized Volumetric Units					Only for Flow Rate
	Alarm Output	Standard Alarm1Error of Thermometer etc.					Only for Standard
	Status Output	Only for Flow Switch					Flow Switch
Display	Upper Line	Select from Flow Rate (%,Engineering Unit) or Temperature (%) (Note 8)					Only for Flow Rate
	Lower Line	Select from Total Rate or Temperature (C, F) (Note 9)					Only for Total Rate
Remote Type		Flow Converter : Select DYA-xxx /MV Signal Cable : Select DYC-xxx /MV (Note 10)					

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(Note 1) When /MV is selected /HT, /LT is not available.

(Note 2) For detailed accuracy, see “SIZING”. Measurement temperature is changed by the heat-insulation method of piping and piping method. Refer to “REMARKS ON INSTALLATION” about heat-insulation.In case of the Mass Flow measurement of saturated steam and superheated steam, it is necessary to make a heat-insulation.

(Note 3) Mass Flow rate is calculated from density values by temperature measurment using saturated steam table.

(Note 4) Mass Flow rate is calculated from density values to temperature measured by using steam table. In order to measure superheated steam, it is necessary to make constant pressure value.A pressure value which is indicated by order sheet is used.

(Note 5) In order to measure gas, Pressure-Temperature correction is carried out. It is necessary to make constant pressure value.
In addition to pressure values at operational condition, temperature and pressure value at standard condition is used, which is indicated by order sheet.

(Note 6) In order to measure mass flow rate of liquid applications, the density at normal condition is used, and if fluid temperature deviates from normal temperature, density value is calculated by 2 dimensional equation. In this case, temperature coefficient should be prepared by user’s side.

(Note 7) Default setting is Flow rate. It is necessary to change the parameter of output in case of setting temperature output.

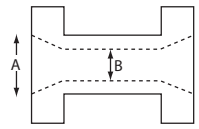
(Note 8) In case of indicating the temperature %, the display indicate not only “%” but also “t” . (“t” is the means of temperature)

(Note 9) Default setting is “temperature” but “Total “ is setup when ordering the Total Rate.

(Note 10) In case of Multi variable (/MV), it is necessary to setup the parameter of Cable Length.

9.4.4 OPTION REDUCED BORE TYPE (/R1, /R2) (Note 1)

This option is the same as standard specification except the following items.

	Reduced bore type (Option Code: /R1, /R2)			
Model Code (Note 2) 	Flange piping size (A)	R1 Detector size (inner dia.) (B)	R2 Detector size (inner dia.) (B)	[Pressure Loss] R1: about 15% increases to standard type. R2: about 28% increases to standard type. see P.16
	DY025	15 (14.6) (mm) (Note 3)		
	DY040	25 (25.7) (mm)	15 (14.6) (mm) (Note 3)	
	DY050	40 (39.7) (mm)	25 (25.7) (mm)	
	DY080	50 (51.1) (mm)	40 (39.7) (mm)	
	DY100	80 (71) (mm)	50 (51.1) (mm)	
	DY150	100 (93.8) (mm)	80 (71) (mm)	
	DY200	150 (138.8) (mm)	100 (93.8) (mm)	
Measurable minimum flow velocity	Liquid, Gas, Steam		Refer to Table 5.	
Range of measurable flow velocity	Liquid, Gas, Steam		Refer to Table 6.	

T10-1.EPS

(Note 1) For detailed accuracy, see "SIZING". Not available for /LT.
Not available for /SF1, /SS1

(Note 2) Flange type only: ANSI150,300 (BA1,BA2,BS1,BS2)
MS Code [*] of "DY***-" means flange piping size.

(Note 3) High process temperature version (/HT) and Multi-variable type (/MV) for DY025/R1 and DY040/R2 are not available.

Table 3 N/A

Table 4 Test Pressure Value

Flange Rating	Pressure
ANSI Class 150	2.9 MPa {29 bar}
ANSI Class 300	7.5 MPa {75 bar}
ANSI Class 600	14.9 MPa {149 bar}
ANSI Class 900	22.3 MPa {223 bar}
PN 10	1.5 MPa {15 bar}
PN 16	2.4 MPa {24 bar}
PN 25	3.75 MPa {37.5 bar}
PN 40	6 MPa {60 bar}
PN 64	9.6 MPa {96 bar}
PN 100	15 MPa {150 bar}
PN 160	24 MPa {240 bar}

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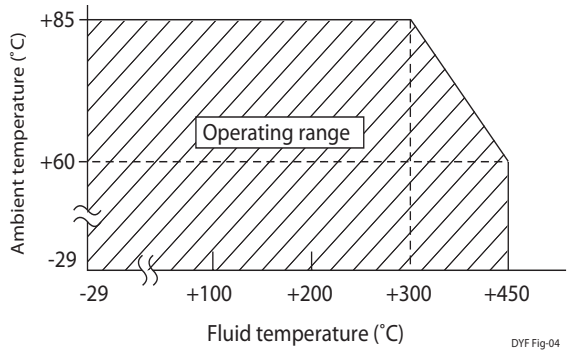


Figure 4 Fluid temperature range of high process temperature version

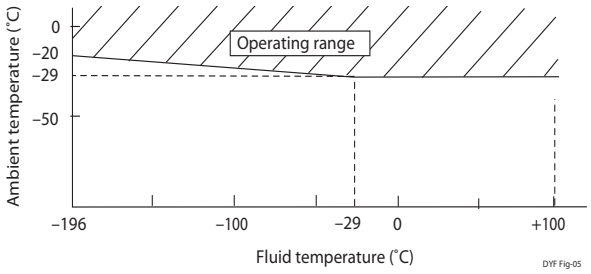
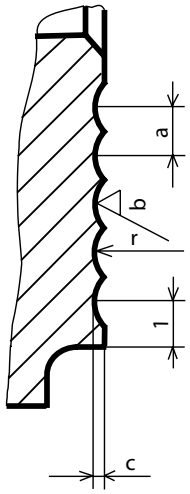


Figure 5 Fluid temperature range of cryogenic version



	Flange facing	
	Standard	Opt./ASF
r [mm]	1,8	0,8
a [mm/U]	0,5	0,35 ... 0,45
b [Ra]	3,2 ... 6,3	3,2 ... 6,3
c [mm]	0,017	0,025

Figure 6 Finish of ANSI Flange Faces

9.5 Sizing

The following items are the basic specifications.
In case of the definite sizing, it is necessary to check by the sizing software.

Measurable minimum flow velocity

Table 5 Relationship between Minimum Velocity and Density (In case of "Gas, Steam", Use the Large of the Two Values)

Model Code		Liquid		GAS, Steam	
		General Type, Cryogenic Type (unit: m/s)	High Process Temperature Version (unit: m/s)	General Type, Cryogenic Type (unit: m/s)	High Process Temperature version (unit: m/s)
DY015	DY025-/R1	$\sqrt{250/\rho}$	—	$\sqrt{80/\rho}$ or 3	—
DY025	DY040-/R1	$\sqrt{122.5/\rho}$	$\sqrt{490/\rho}$	$\sqrt{45/\rho}$ or 2	$\sqrt{125/\rho}$ or 2
DY040	DY050-/R1	$\sqrt{90/\rho}$	$\sqrt{302.5/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{90.3/\rho}$ or 2
DY050	DY080-/R1	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{61.3/\rho}$ or 2
DY080	DY100-/R1	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{61.3/\rho}$ or 2
DY100	DY150-/R1	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{61.3/\rho}$ or 2
DY150	DY200-/R1	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 3	$\sqrt{61.3/\rho}$ or 3
DY200	—	$\sqrt{122.5/\rho}$	$\sqrt{202.5/\rho}$	$\sqrt{45/\rho}$ or 3	$\sqrt{80/\rho}$ or 3
DY250	—	$\sqrt{160/\rho}$	—	$\sqrt{61.3/\rho}$ or 3	—
DY300	—	$\sqrt{160/\rho}$	—	$\sqrt{61.3/\rho}$ or 3	—

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r : Density at operating conditions (kg/m^3)
Liquid density is 400 up to 2000 kg/m^3

Guaranteed accuracy at minimum flow velocity

Table 6 Range of Measurable flow velocity

Fluid	Model Code			Minimum flow velocity	Maximum flow velocity (Note)
Liquid	DY015 up to DY300	DY025-/R1 up to DY200-/R1	DY040-/R2 up to DY200-/R2	"flow velocity obtained from Table 5" or "flow velocity at Reynolds number of 5000", whichever is greater. For liquid Reynolds number of 5000: See P. 9-16 "Calculation formula".	10 m/s
Gas, Steam	DY015 up to DY300	DY025-/R1 up to DY200-/R1	DY040-/R2 up to DY200-/R2	"flow velocity obtained from Table 5" or "flow velocity at Reynolds number of 5000", whichever is greater. For Gas and steam Reynolds number of 5000: See P. 9-16 "Calculation formula".	80 m/s

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When the flow velocity is lower than minimum, both the analog output and the pulse output is displayed as zero "0".
(Note) A span setting is available up to 1.5 times of the maximum flow velocity.

Table 7 Range of Guaranteed Accuracy Flow Velocity

Fluid	Model Code			Minimum flow velocity	Maximum flow velocity (Note)
Liquid	DY015 up to DY100	DY025-/R1 up to DY150-/R1	DY040-/R2 up to DY200-/R2	"flow velocity obtained from Table 5" or "flow velocity at Reynolds number of 20000", whichever is greater. For liquid Reynolds number of 20000: The value is four times velocity value in P. 9-16 "Calculation formula".	10 m/s
	DY150 up to DY300	DY200-/R1	—	"flow velocity obtained from Table 5" or "flow velocity at Reynolds number of 40000", whichever is greater. For liquid Reynolds number of 40000: The value is eight times velocity value in P. 9-16 "Calculation formula".	
Gas, Steam	DY015 up to DY100	DY025-/R1 up to DY150-/R1	DY040-/R2 up to DY200-/R2	"flow velocity obtained fromTable 5" or "flow velocity at Reynolds number of 20000", whichever is greater. For gas and steam Reynolds number of 20000: See P. 9-16 "Calculation formula".	80 m/s
	DY150 up to DY300	DY200-/R1	—	"flow velocity obtained fromTable 5" or "flow velocity at Reynolds number of 40000", whichever is greater. For gas and steam Reynolds number of 40000 See P. 9-16 "Calculation formula".	

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Detailed Accuracy (for Table 9.5.3 Range of Guaranteed Accurancy Flow Velocity.)

Volumetric flow rate at operation condition

<table>
<tr><th></th><th>Model Code</th><th>General Type</th><th>Multi-Variable Type (/MV)</th><th>Reduced Bore Type (/R1)</th><th>Reduced Bore Type (/R2)</th></tr>
<tr><td rowspan="12">Liquid</td><td>DY015</td><td>1.0 % of Reading (20000 ≤ Re)</td><td></td><td></td><td></td></tr>
<tr><td>DY025</td><td rowspan="5">±1.0 % of Reading
(20000 ≤ Re < D × 10^3)
±0.75 ≤ of Reading
(D × 10^3 ≤ Re)</td><td rowspan="5">±1.0 % of Reading
(20000 ≤ Re < D × 10^3)
±0.75 ≤ of Reading
(D × 10^3 ≤ Re)</td><td rowspan="6">±1.0 % of Reading (20000 ≤ Re)</td><td></td></tr>
<tr><td>DY040</td><td rowspan="6">±1.0 % of Reading (20000 ≤ Re)</td></tr>
<tr><td>DY050</td></tr>
<tr><td>DY080</td></tr>
<tr><td>DY100</td></tr>
<tr><td>DY150</td><td rowspan="4">±1.0 % of Reading
(40000 ≤ Re)</td><td rowspan="2">±1.0% of Reading
(40000 ≤ Re)</td></tr>
<tr><td>DY200</td><td>±1.0 % of Reading (40000 ≤ Re)</td></tr>
<tr><td>DY250</td><td></td><td></td><td></td></tr>
<tr><td>DY300</td><td></td><td></td><td></td></tr>
<tr><td rowspan="10">Gas, Steam</td><td>DY015</td><td rowspan="10">±1.0 % of Reading
(Velocity 35 m/s or less)
±1.5 % of Reading
(Velocity 35 m/s up to 80 m/s)</td><td></td><td></td><td></td></tr>
<tr><td>DY025</td><td rowspan="8">±1.0 % of Reading
(Velocity 35 m/s or less)
±1.5 % of Reading
(Velocity 35 m/s up to 80 m/s)</td><td rowspan="8">±1.0 % of Reading
(Velocity 35 m/s or less)
±1.5 % of Reading
(Velocity 35 m/s up to 80 m/s)</td><td></td></tr>
<tr><td>DY040</td><td rowspan="8">±1.0 % of Reading
(Velocity 35 m/s or less)
±1.5 % of Reading
(Velocity 35 m/s up to 80 m/s)</td></tr>
<tr><td>DY050</td></tr>
<tr><td>DY080</td></tr>
<tr><td>DY100</td></tr>
<tr><td>DY150</td></tr>
<tr><td>DY200</td></tr>
<tr><td>DY250</td><td></td><td></td><td></td></tr>
<tr><td>DY300</td><td></td><td></td><td></td></tr>
</table>

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D : Inner diameter of digitalYEWFLO detector (mm)
Re: Reynolds number (non unit)

Note: This table shows the accuracy of pulse output. In case of analog output, add up ±0.1 % of full scale to the values mentioned above.

Mass flow or Volumetric flow rate at Normal/Standard condition:
for Multi-Variable Type and combination of Multi-Variable Type and Reduced Bore Type

<table>
<tr><th></th><th>Model Code</th><th>Multi-VariableType (/MV)</th><th>Multi-VariableType (/MV) / Reduced Bore Type (/R1)</th><th>Multi-VariableType (/MV) / Reduced Bore Type (/R2)</th></tr>
<tr><td rowspan="10">Liquid</td><td>DY025</td><td rowspan="5">±2.0 % of Reading (20000 ≤ Re < D × 10^3)
±1.5 % of Reading (D × 10^3 ≤ Re)</td><td></td><td></td></tr>
<tr><td>DY040</td><td rowspan="6">±2.0 % of Reading (20000 ≤ Re)</td><td></td></tr>
<tr><td>DY050</td><td rowspan="6">±2.0 % of Reading (20000 ≤ Re)</td></tr>
<tr><td>DY080</td></tr>
<tr><td>DY100</td></tr>
<tr><td>DY150</td><td rowspan="2">±2.0 % of Reading (40000 ≤ Re)</td></tr>
<tr><td>DY200</td><td>±2.0 % of Reading (40000 ≤ Re)</td></tr>
<tr><td rowspan="8">Gas, Steam</td><td>DY025</td><td rowspan="8">±2.0 % of Reading (Velocity 35 m/s or less)
± 2.5 % of Reading (Velocity 35 m/s up to 80 m/s)</td><td></td><td></td></tr>
<tr><td>DY040</td><td rowspan="7">±2.0 % of Reading (Velocity 35 m/s or less)
± 2.5 % of Reading (Velocity 35 m/s up to 80 m/s)</td><td></td></tr>
<tr><td>DY050</td><td rowspan="7">±2.0 % of Reading (Velocity 35 m/s or less)
± 2.5 % of Reading (Velocity 35 m/s up to 80 m/s)</td></tr>
<tr><td>DY080</td></tr>
<tr><td>DY100</td></tr>
<tr><td>DY150</td></tr>
<tr><td>DY200</td></tr>
</table>

DYF Tab-13-b

D : Inner diameter of digitalYEWFLO detector (mm)
Re: Reynolds number (non unit)

Note: This table shows the accuracy of pulse output. In case of analog output, add up ±0.1% of full scale to the values mentioned above.

Calculation formula

How to calculate volume flow rate at operating conditions.

- $Qf = 3600 \times \upsilon \times S$ or $Qf = \dfrac{\upsilon \times D^2}{354}$

How to calculate the velocity of a Reynolds number.

- $\upsilon = 5 \times \nu / D$ (Reynolds number of 5000)
- $\upsilon = 20 \times \nu / D$ (Reynolds number of 20000)
- $\upsilon = 40 \times \nu / D$ (Reynolds number of 40000)

however

- $Re = \dfrac{354 \times 10^3 \times Qf}{\nu \times D}$ ..... (1)

- $\nu = \dfrac{\mu}{\rho f} \times 10^3$ ..... (2)

Qf : Volume flow rate at operating conditions (m^3/h)
D : Inner diameter of YEWFLO (mm)
S : Cross section of YEWFLO (m^2)
υ : Flow velocity (m/s)
Re : Reynolds number (none unit)
ρf : Density at operating conditions (kg/m^3)
μ : Viscosity at operating conditions (mPa·s{cP})
ν : Kinematic viscosity at operating conditions ($10^{-6}m^2/s${cSt})

Typical fluid example

Table 8 Range of Measurable Water Flow Rate

(At standard condition of 15°C, ρ = 1000 kg/m^3)

Model Code			Measurable Flow Rate in m^3/h	Range of Guaranteed Accuracy Flow Rate in m^3/h
DY015	DY025-/R1	DY040-/R2	0.30 up to 6	0.94 up to 6
DY025	DY040-/R1	DY050-/R2	0.65 up to 18	1.7 up to 18
DY040	DY050-/R1	DY080-/R2	1.3 up to 44	2.6 up to 44
DY050	DY080-/R1	DY100-/R2	2.2 up to 73	3.3 up to 73
DY080	DY100-/R1	DY150-/R2	4.3 up to 142	4.6 up to 142
DY100	DY150-/R1	DY200-/R2	7.5 up to 248	7.5 up to 248
DY150	DY200-/R1	—	17 up to 544	18 up to 544
DY200	—	—	34 up to 973	34 up to 973
DY250	—	—	60 up to 1506	60 up to 1506
DY300	—	—	86 up to 2156	86 up to 2156

DYF Tab-14-b

Table 9 Range of Measurable Air Flow Rate at Selected Process Pressures

Model Code			Flow Rate Limits	Minimum and Maximum Measurable Flow Rate in Nm^3/h									
				0 MPa	0.1 MPa	0.2 MPa	0.4 MPa	0.6 MPa	0.8 MPa	1 MPa	1.5 MPa	2 MPa	2.5 MPa
DY015	DY025 -/R1	DY040 -/R2	min.	4.8(11.1)	6.7(11.1)	8.2(11.1)	10.5(11.1)	12.5	16.1	19.7	28.6	37.5	46.4
			max.	48.2	95.8	143	239	334	429	524	762	1000	1238
DY025	DY040 -/R1	DY050 -/R2	min.	11.0(19.5)	15.5(19.5)	19.0(19.5)	24.5	29.0	33.3	40.6	59.0	77.5	95.9
			max.	149	297	444	739	1034	1329	1624	2361	3098	3836
DY040	DY050 -/R1	DY080 -/R2	min.	21.8(30.0)	30.8	37.8	48.7	61.6	79.2	97	149	184	229
			max.	356	708	1060	1764	2468	3171	3875	5634	7394	9153
DY050	DY080 -/R1	DY100 -/R2	min.	36.2(38.7)	51	62.4	80.5	102	131	161	233	306	379
			max.	591	1174	1757	2922	4088	5254	6420	9335	12249	15164
DY080	DY100 -/R1	DY150 -/R2	min.	70.1	98.4	120	155	197	254	310	451	591	732
			max.	1140	2266	3391	5642	7892	10143	12394	18021	23648	29274
DY100	DY150 -/R1	DY200 -/R2	min.	122	172	211	272	334	442	540	786	1031	1277
			max.	1990	3954	5919	9847	13775	17703	21632	31453	41274	51095
DY150	DY200 -/R1	—	min.	268	377	485	808	1131	1453	1776	2583	3389	4196
			max.	4358	8659	12960	21559	30163	38765	47365	68867	90373	111875
DY200	—	—	min.	575	809	990	1445	2202	2599	3175	4617	6059	7501
			max.	7792	15482	23172	38549	53933	69313	84693	123138	161591	200046
DY250	—	—	min.	1037	1461	1788	2306	3127	4019	4911	7140	9370	11600
			max.	12049	23939	35833	59611	83400	107181	130968	190418	249881	309334
DY300	—	—	min.	1485	2093	2561	3303	4479	5756	7033	10226	13419	16612
			max.	17256	34286	51317	85370	119441	153499	187556	272699	357856	443017

DYF Tab-15

(1) At standard conditions STP (0 °C, 1 atm = 1.013 bar abs).
(2) Pressure listed is at process temperature of 0 °C.
(3) Maximum flow rate is the lower of 80 m/s.
(4) Minimum values are determined from Table 6. The values in parenthesis show the minimum linear flow rates (Re = 20,000 or 40,000) when they are higher than the minimum measurable flow rate.

Table 10 Range of Measurable Saturated Steam Flow Rate at Selected Process Pressures

Model Code			Flow Rate Limits	Minimum and Maximum Measurable Flow Rate in kg/h									
				0.1 MPa	0.2 MPa	0.4 MPa	0.6MPa	0.8 MPa	1 MPa	1.5 MPa	2 MPa	2.5 MPa	3 MPa
DY015	DY025 -/R1	DY040 -/R2	min.	5.8(10.7)	7.0(11.1)	8.8(11.6)	10.4(12.1)	11.6(12.3)	12.8	15.3	19.1	23.6	28.1
			max.	55.8	80	129	177	225	272	390	508	628	748
DY025	DY040 -/R1	DY050 -/R2	min.	13.4(18.9)	16.2(20.0)	20.5	24.1	27.1	30	36	41	49	58
			max.	169.7	247.7	400	548	696	843	1209	1575	1945	2318
DY040	DY050 -/R1	DY080 -/R2	min.	26.5(29.2)	32	40.6	47.7	53.8	59	72	93	116	138
			max.	405	591	954	1310	1662	2012	2884	3759	4640	5532
DY050	DY080 -/R1	DY100 -/R2	min.	44.0	53	67.3	79	89	98	119	156	192	229
			max.	671	979	1580	2170	2753	3333	4778	6228	7688	9166
DY080	DY100 -/R1	DY150 -/R2	min.	84.9	103	130	152	171	189	231	300	371	442
			max.	1295	1891	3050	4188	5314	6435	9224	12024	14842	17694
DY100	DY150 -/R1	DY200 -/R2	min.	148	179	227	267	300	330	402	524	647	772
			max.	2261	3300	5326	7310	9276	11232	16102	20986	25907	30883
DY150	DY200 -/R1	—	min.	324	392	498	600	761	922	1322	1723	2127	2536
			max.	4950	7226	11661	16010	20315	24595	35258	45953	56729	67624
DY200	—	—	min.	697	841	1068	1252	1410	1649	2364	3081	3803	4534
			max.	8851	12918	20850	28627	36325	43976	63043	82165	101433	120913
DY250	—	—	min.	1256	1518	1929	2260	2546	2801	3655	4764	5882	7011
			max.	13687	19977	32243	44268	56172	68005	97489	127058	156854	186978
DY300	—	—	min.	1799	2174	2762	3236	3646	4012	5235	6823	8423	10041
			max.	19602	28609	46175	63397	80445	97390	139614	181960	224633	267772

DYF Tab-16

(1) Maximum flow rate is the lower of 80 m/s.
(3) Minimum values are determined from Table 6. The values in parenthesis show the minimum linear flow rates (Re = 20,000 or 40,000) when they are higher than the minimum measurable flow rate.

Reference

Table 11 Inner Diameter and Nominal value

Model Code			Inner Diameter mm	Nominal K-Factor Pulse/L	Nominal Pulse Rate	
					Hz/m/s	Hz/m³/h
DY015	DY025-/R1	DY040-/R2	14.6	376	62.7	104
DY025	DY040-/R1	DY050-/R2	25.7	65.6	35.5	19.1
DY040	DY050-/R1	DY080-/R2	39.7	18.7	23.1	5.19
DY050	DY080-/R1	DY100-/R2	51.1	8.95	18.3	2.49
DY080	DY100-/R1	DY150-/R2	71.0	3.33	13.2	0.925
DY100	DY150-/R1	DY200-/R2	93.8	1.43	9.88	0.397
DY150	DY200-/R1	—	138.8	0.441	6.67	0.123
DY200	—	—	185.6	0.185	5.00	0.0514
DY250	—	—	230.8	0.0966	4.04	0.0268
DY300	—	—	276.2	0.0563	3.37	0.0156

DYF Tab-14

Pressure Loss

Calculation of pressure loss for general type

obtained from the following equations.

$\Delta P = 108 \times 10^{-5} \times \rho_f \times \upsilon^2$ ····· (1)

or

$\Delta P = 135 \times \rho_f \times \frac{Q_f^2}{D^4}$ ····· (2)

where,

ΔP : Pressure loss (kPa)
ρ_f : Density at operating condition (kg/m³)
υ : Flow velocity (m/s)
Q_f : Actual flow rate (m³/h)
D : Internal Diameter of detector (mm)

(Example)

DY050, hot water: 80 °C, flowrate: 30 m³/h

1. Since the density of water at 80 °C is 972 kg/m³, substitute this value in equation (2):

$\Delta P = 135 \times 972 \times 30^2 / 51.1^4$
$= 17.3$ kPa

2. Obtain the pressure loss using equation (1). The flow velocity when the flow rate is 30 m³/h is given by:

$\upsilon = 354 \times Q_f / D^2 = \frac{354 \times 30}{51.1^2} = 4.07$ m/s

Therefore, substitute this value in equation (1):

$\Delta P = 108 \times 10^{-5} \times 972 \times 4.07^2$
$= 17.3$ kPa

Calculation of pressure loss for reduced bore type (Option code: /R1)

obtained from the following equations.

$\Delta P = 124 \times 10^{-5} \times \rho_f \times \upsilon^2$ ····· (3)

or

$\Delta P = 155 \times \rho_f \times Qf^2 / D^4$ ····· (4)

(Example)

DY040-/R1, hot water: 50 deg C flowrate: 10 m³/h

1. Since the density of water at 50 deg C is 992 kg/cm³, substitute this value in equation (4):

$\Delta P = 155 \times 992 \times 10^2 / 25.7^4$
$= 35.3$ kPa

2. Obtain by using equation (3). The flow velocity when the flow rate is 10 m³/h is given by:

$\upsilon = 354 \times Qf / D^2 = 354 \times 10 / 25.7^2$
$= 5.4$ m/s

Therefore, substitute this value in equation (3):

$\Delta P = 124 \times 10^{-5} \times 992 \times 5.4^2$
$= 35.3$ kPa

Calculation of pressure loss for reduced bore type (Option code: /R2)

obtained from the following equations.

$\Delta P = 138 \times 10^{-5} \times \rho_f \times \upsilon^2$ ····· (5)

or

$\Delta P = 173 \times \rho_f \times \frac{Q_f^2}{D^4}$ ····· (6)

(Example)

DY050-/R2, hot water: 50 °C, flowrate: 15 m³/h

1. Since the density of water at 50 °C is 992 kg/cm³, substitute this value in equation (6):

$\Delta P = 173 \times 992 \times 15^2 / 25.7^4$
$= 88.5$ kPa

2. Obtain by using equation (5). The flow velocity when the flow rate is 15m³/h is given by:

$\upsilon = 354 \times Q_f / D^2 = \frac{354 \times 15}{25.7^2} = 8.0$ m/s

Therefore, substitute this value in equation (5):

$\Delta P = 138 \times 10^{-5} \times 992 \times 8.0^2$
$= 88.5$ kPa

Cavitation

(Minimum Back Pressure, Liquid service only):

Cavitation occurs when the flow line pressure is low and flow velocity is high during fluid measurement, preventing correct measurement of flow rate. The optimum line pressure can be obtained from the following equation.

$P = 2.7 \cdot \Delta P + 1.3 \cdot Po$ ····· (5)

Where,

P : Line pressure, 2 to 7 times as large as internal diameter on downstream of flowmeter body surface. (kPa absolute).
ΔP : Pressure loss (kPa). Refer to the item above.
Po : Saturation liquid vapor pressure at operating temperature (kPa absolute).

(Example) Confirmation of presence of cavitation

Suppose that the line pressure is 120 kPa abs and the flow rate scale is 0 to 30 m³/h. It is only necessary to confirm the pressure at the maximum flow rate ; therefore, the saturated steam pressure of water at 80°C is as follows from the table of saturated steam pressures:

Po = 47.4 kPa abs

Therefore, substitute this value in equation (5):

P = 2.7 3 17.3 + 1.3 3 47.4
= 108.3 kPa abs

Since the operating pressure of 120 kPa abs is higher than 108.3 kPa abs, no cavitation occurs.

9.6 REMARKS ON INSTALLATION

Piping support

Typical vibration immunity level is 1G for normal piping condition. Piping support should be fixed in case of over 1G vibration level.

Installation direction

If a pipe is always filled with liquids, the pipe can be installed vertically or at inclined angle

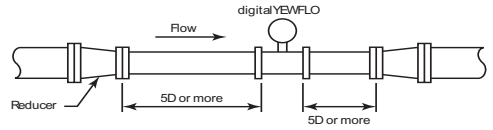
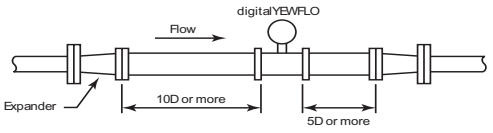
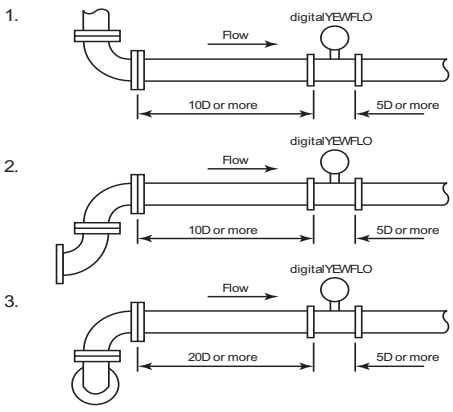
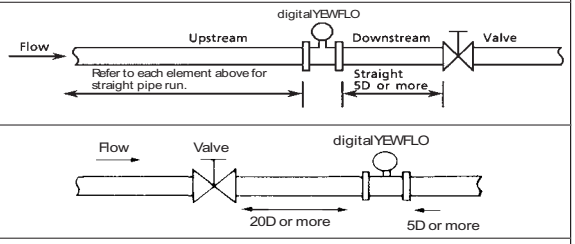
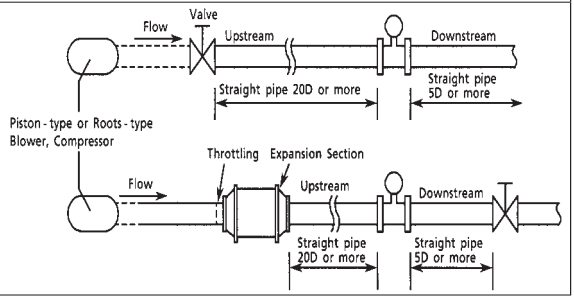
Adjacent pipes

The process pipeline inner diameter should be larger than the digitalYEWFLO inner diameter.
Use the following adjacent pipe.

Model Code DY015 up to DY050: Sch 40 or less.
DY025-/R1 up to DY080-/R1
DY040-/R2 up to DY100-/R2
Model Code DY080 up to DY300: Sch 80 or less.
DY100-/R1 up to DY200-/R1
DY150-/R2 up to DY200-/R2

Straight pipe length

*D: piping diameter
*K-factor may be influenced about 0.5 % in case that straight pipe length of upstream is less than values below.

Description	Figure
Reducer pipe: Ensure the upstream straight pipe length to be 5D or more, and the downstream straight pipe length to be 5D or more for per reducer pipe.	
Expander pipe: Ensure the upstream straight pipe length to be 10D or more, and the downstream straight pipe length to be 5D or more for per expander pipe.	
Bent pipe and straight pipe length: 1. Single bent pipe 2. Double bent pipe; coplanar 3. Double bent pipe; non coplanar	
Valve position and straight pipe length: ■ Install the valve on the downstream side of the flowmeter. The upstream straight pipe length dependent on the element located on the upstream such as reducer/expander, bent and etc., refer to description as above. Keep 5D or more for downstream straight pipe length. ■ In case the valve has to be installed on the upstream of the flowmeter, ensure the upstream straight pipe length to be 20D or more, and the downstream straight pipe length be 5D or more.	
Fluid vibration: For a gas line which uses a piston-type or roots-type blower compressor or a high-pressure liquid line (about 1MPa or more) which uses piston-type or plunger-type pump, fluid vibrations may be produced. In these case, install valve on the upstream side of digitalYEWFLO. For inevitable fluid vibration, put a vibration damping device such as throttling plate or expansion section in the upstream side of digitalYEWFLO.	

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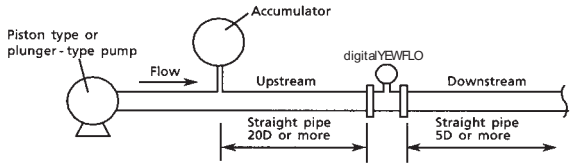
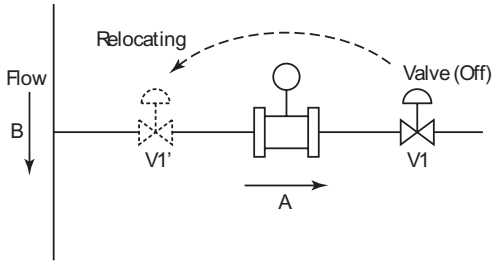
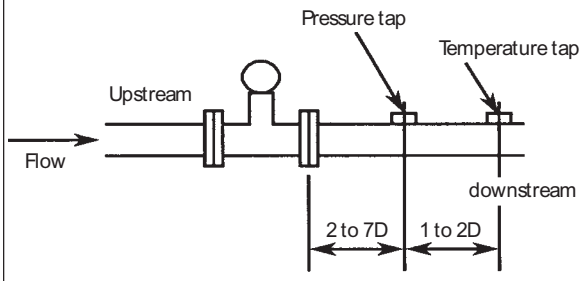
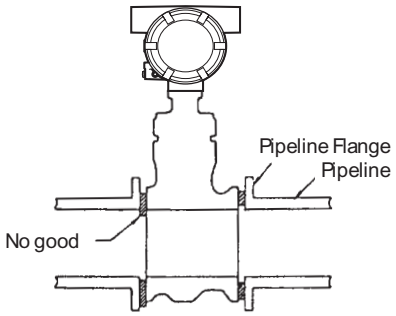
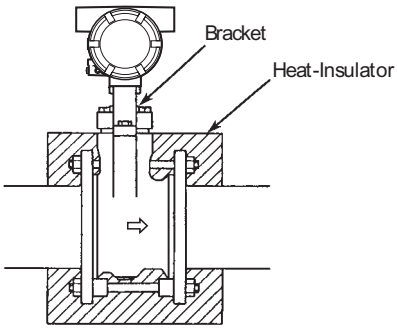
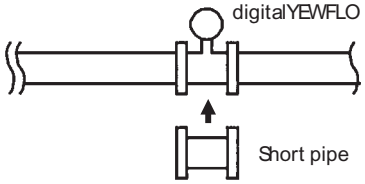
Description	Figure
Piston-type or plunger pump: Install the accumulator on the upstream side of digitalYEWFLO to reduce fluid vibrations.	
Valve positon (T-type piping exist): When pulsation caused by a T-type piping exist, install the valve on the upstream of the flowmeter. Example: As shown in the figure, when the valve V1 is turned off, the fluid flow through B as to meter A the flow is zero. But due to the pulsating pressure is detected, the meter´s zero point becomes fluctuating. To avoid this, change the valve V1 location to V1'.	
Pressure and Temperature Taps: Pressure tap outlet: install this tap between 2D and 7D on the downstream side of a flowmeter. Temperature tap outlet: install this on the downstream side 1D to 2D away from a pressure tap.	
Mounting Gasket: Avoid mounting gaskets which protrude into the pipe line. This may cause inaccurate readings. Use the gasket with bolt holes, even if digitalYEWFLO is the wafer type. When using a spiral gasket(without bolt holes), confirm the size with the gasket -manufacturer, as standard items may not be used for certain flange ratings.	
Heat-Insulation: When an integral-type flowmeter or a remote type detector is installed and the pipe carrying high-temperature fluids is heat-insulated, do not wrap adiabatic materials around the installation bracket of the converter.	
Flushing of the pipe line: Flush and clean scale, incrustation and sludge on the inside of pipe for newly installed pipe line and repaired pipe line before the operation. For flushing, the flow should flow through bypass-piping to avoid damaging the flowmeter. If there is no bypass-piping, install short pipe instead of the flowmeter.	

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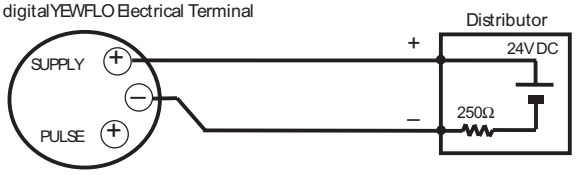
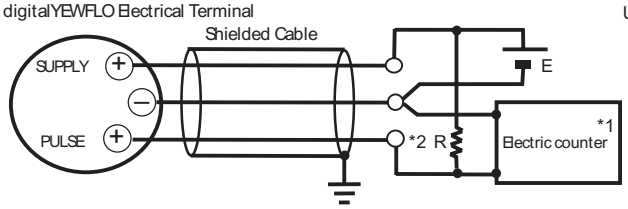
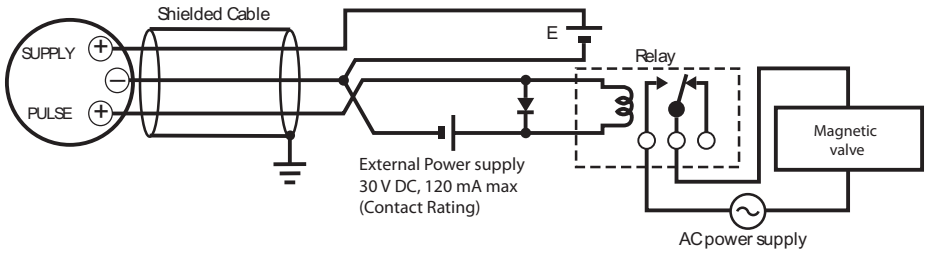
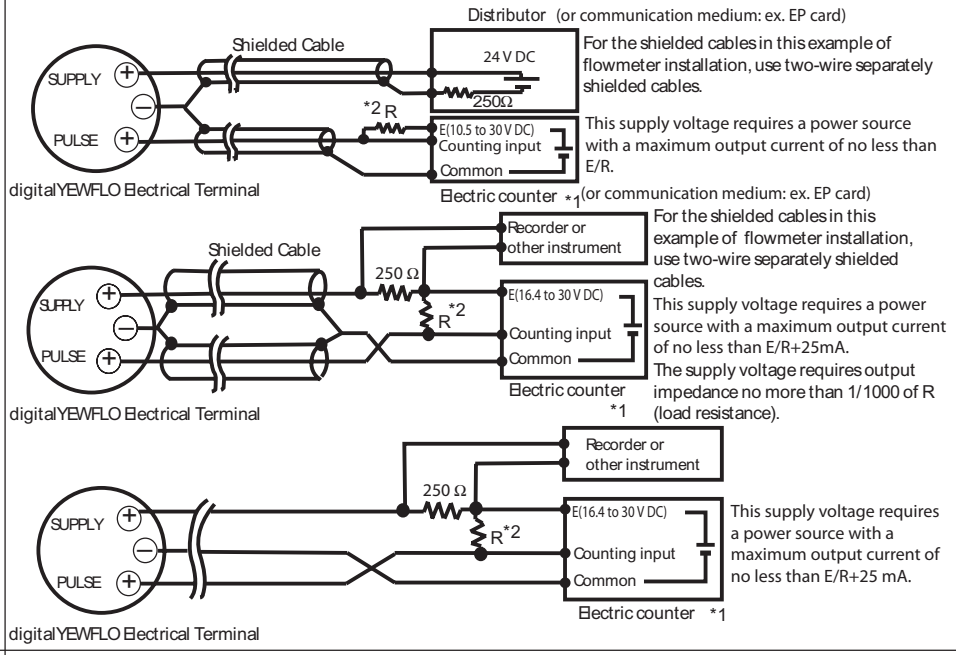
The wiring example for simultaneous analog and pulse and alarm, status output.

Connection	Description
Analog Output In this case, communication is possible (up to a distance of 2 km when a CEV cable is used.)	digitalYEWFLO Electrical Terminal 
Pulse Output In this case, no communication is possible.	digitalYEWFLO Electrical Terminal Use the Three-wire shielded cable. 
Status Output **Alarm Output** In this case, no communication is possible.	digitalYEWFLO Electrical Terminal Use the Three-wire shielded cable. 
Simultaneous Analog -Pulse Output Example 1 In this case, communication is possible (up to a distance of 2 km when a CEV cable is used). Example 2 In this case, communication is possible (up to a distance of 200 m when a CEV cable is used) and R = 1 kΩ). Example 3 In this case, no communication is possible (when shielded cable is not used).	When analog and pulse output are used, the length of communication line is subjected to wiring conditions. Refer to example 1 to 3. If the communication carries out from amplifier, no need to consider wiring conditions. 
The range of load resistance R for the pulse output.	The load resistance of pulse output should be used to 1 kΩ, 2 W. If no translation of the pulse output is possible by the cable length or the frequency of the pluse output, the load resistance should be selected by calculation as shown below. $\frac{E(V)}{120} \leq R(k\Omega) \leq \frac{0.1}{C(\mu F) \times f(kHz)}$ Example of CEV cable capacitance = 0.1μF/km $P(mW) = \frac{E^2(V)}{R(k\Omega)}$ Where E = Supply voltage (V) f = Frequency of pulse output (kHz) R= Value of load resistance (kΩ) C = Cable capacitance (μF) P = Power ratio of the load resistance (mW)

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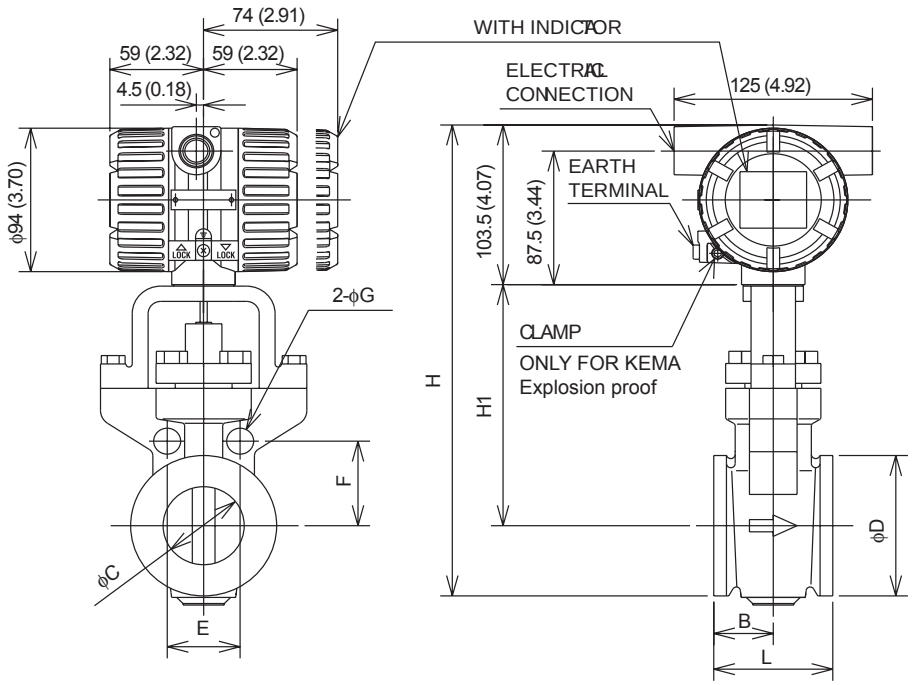
*1: To avoid the influence of external noise, use an electric counter which fits to the pulse frequency.
*2: Resistor is not necessary in case of an electric counter which can receive contact pulse signal directly.

9.7 External Dimensions

Wafer type (DY015 up to DY100)

Unit: mm
(approx. inch)



TYPE	INTEGRAL/REMOTE													
CODE	DY015 (15mm,½in)							DY025 (25mm,1in)						
PROCESS CONNECTION	AA1	AA2	AA4	AD1 - AD4	N/A	N/A	N/A	AA1	AA2	AA4	AD1 - AD4	N/A	N/A	N/A
L	70 (2.76)							70 (2.76)						
B	35 (1.38)							35 (1.38)						
C	14.6 (0.57)							25.7 (1.01)						
D	35.1 (1.38)							50.8 (2.00)						
H	248 (9.76)							258 (10.16)						
H1	127 (5.00)							129 (5.08)						
E	42.7 (1.68)	47.1 (1.85)	47.1 (1.85)	46 (1.81)				56 (2.21)	62.9 (2.48)	62.9 (2.48)	60.1 (2.37)			
F	21.4 (0.84)	23.5 (0.93)	23.5 (0.93)	23 (0.91)				28 (1.10)	31.4 (1.24)	31.4 (1.24)	30.1 (1.19)			
G	14 (0.55)	14 (0.55)	14 (0.55)	13 (0.51)				14 (0.55)	17 (0.67)	17 (0.67)	13 (0.51)			
WEIGHT kg	2.8 (6.17lb)							3.7 (8.16lb)						

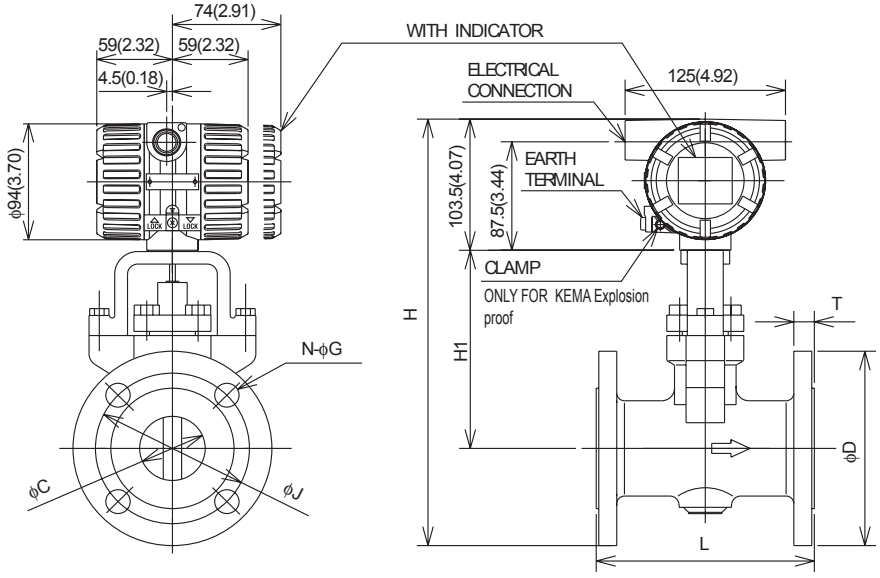
TYPE	INTEGRAL/REMOTE													
CODE	DY040 (40mm,1½in)							DY050 (50mm,2in)						
PROCESS CONNECTION	AA1	AA2	AA4	AD1 - AD4	N/A	N/A	N/A	AA1	AA2	AA4	AD1 - AD4	N/A	N/A	N/A
L	70 (2.76)							75 (2.95)						
B	35 (1.38)							37.5 (1.48)						
C	39.7 (1.56)							51.1 (2.01)						
D	73 (2.87)							92 (3.62)						
H	276 (10.87)							307.5 (12.11)						
H1	136 (5.35)							158 (6.22)						
E	69.7 (2.74)	80.8 (3.18)	80.8 (3.18)	77.8 (3.06)				(Note 3)	48.6 (1.91)	48.6 (1.91)	(Note 3)			
F	34.8 (1.37)	40.4 (1.59)	40.4 (1.59)	38.9 (1.53)				(Note 3)	58.7 (2.31)	58.7 (2.31)	(Note 3)			
G	14 (0.55)	20 (0.79)	20 (0.79)	17 (0.67)				(Note 3)	17 (0.67)	17 (0.67)	(Note 3)			
WEIGHT kg	4.3 (9.48lb)							6.0 (13.23lb)						

TYPE	INTEGRAL/REMOTE															
CODE	DY080 (80mm,3in)								DY100 (100mm,4in)							
PROCESS CONNECTION	AA1	AA2	AA4	AD1 - AD2	AD3 - AD4	N/A	N/A	N/A	AA1	AA2	AA4	AD1 - AD2	AD3 - AD4	N/A	N/A	N/A
L	100 (3.94)								120 (4.72)							
B	40 (1.57)								50 (1.97)							
C	71 (2.80)								93.8 (3.69)							
D	127 (5.00)								157.2 (6.19)							
H	342 (13.47)								372 (14.65)							
H1	175 (6.89)								190 (7.48)							
E	(Note 3)	64.4 (2.54)	64.4 (2.54)	61.2 (2.41)	61.2 (2.41)				72.9 (2.87)	76.6 (3.02)	82.6 (3.25)	68.9 (2.71)	72.7 (2.86)			
F	(Note 3)	77.7 (3.06)	77.7 (3.06)	73.9 (2.91)	73.9 (2.91)				88 (3.46)	92.5 (3.64)	99.7 (3.93)	83.1 (3.27)	87.8 (3.46)			
G	(Note 3)	20 (0.79)	20 (0.79)	17 (0.67)	17 (0.67)				17 (0.67)	20 (3.06)	23 (0.91)	17 (0.67)	21 (0.83)			
WEIGHT kg	9.4 (20.73lb)								12.8 (28.22lb)							

(Note 1) Integral weight is the same as Remote.
(Note 2) In case of with Indicator, add 0.2kg.
(Note 3) The hole is not provided.
(Note 4) The flow direction is opposite (right to left when facing onto indicator) in case of code /CRC.

Flange type (DY015 up to DY100)

Unit: mm
(approx. inch)



TYPE		INTEGRAL/REMOTE																				
CODE		DY015 (15mm,½in)										DY025 (25mm,1in)										
PROCESS CONNECTION		BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	BD5 - BD6	BD7	CA4	CA5	N/A	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	BD5 - BD6	BD7	N/A	CA4	CA5
L		130 (5.12)			160 (6.30)	130 (5.12)		140 (5.51)		160 (6.30)		150 (5.91)			190 (7.48)	150 (5.91)	140 (5.51)	140 (5.51)		170 (6.69)	190 (7.48)
C		14.6 (0.58)										25.7 (1.01)									
D		88.9 (3.50)	95.3 (3.75)	95.3 (3.75)	120.7 (4.75)	95 (3.74)	105 (4.13)	105 (4.13)	95.3 (3.75)	120.7 (4.75)		108 (4.25)	124 (4.88)	124 (4.88)	149.4 (5.88)	115 (4.53)	140 (5.51)	140 (5.51)		124 (4.88)	149.4 (5.88)
H		275 (10.83)	278 (10.94)	278 (10.94)	291 (11.46)	278 (10.94)	283 (11.14)	283 (11.14)	278 (10.94)	291 (11.46)		286.5 (11.28)	294.5 (11.59)	294.5 (11.59)	307 (12.09)	290 (11.42)	302.5 (11.91)	303 (11.93		294.5 (11.59)	307 (12.09)
H1		127 (5.00)										129 (5.08)									
T		11.2 (0.44)	14.2 (0.56)	21 (0.83)	28.8 (1.13)	16 (0.63)	20 (0.79)	20 (0.79)	19.9 (0.78)	28.8 (1.13)		14.2 (0.56)	17.5 (0.69)	24 (0.94)	34.9 (1.37)	18 (0.71)	24 (0.94)	24 (0.94)		24 (0.94)	34.9 (1.37)
J		60.5 (2.38)	66.5 (2.62)	66.5 (2.62)	82.6 (3.25)	65 (2.56)	75 (2.95)	75 (2.95)	66.5 (2.62)	82.6 (3.25)		79.2 (3.12)	89 (3.50)	89 (3.50)	101.6 (4.00)	85 (3.35)	100 (3.93	100 (3.93		89 (3.50)	101.6 (4.00)
N		4 (0.16)										4 (0.16)									
G		15.7 (0.62)	15.7 (0.62)	15.7 (0.62)	22.4 (0.88)	14 (0.55)	14 (0.55)	14 (0.55)	15.7 (0.62)	22.4 (0.88)		15.7 (0.62)	19 (0.75)	19 (0.75)	25.4 (1.00)	14 (0.55)	18 (0.71)	18 (0.71)		19 (0.75)	25.4 (1.00)
WEIGHT	kg	4.1	4.3	4.6	6.7	4.2	5.4	5.4	4.5	6.8		6.6	7.2	7.7	11.1	6.9	9.6	9.6		7.9	11.4
	lb	9.04	9.48	10.14	14.77	9.26	11.91	11.91	9.92	14.99		14.55	15.88	16.98	24.48	15.21	21.16	21.16		17.42	25.14

TYPE		INTEGRAL/REMOTE																				
CODE		DY040 (40mm,1½in)										DY050 (50mm, 2in)										
PROCESS CONNECTION		BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	BD5 - BD6	BD7	CA4	CA5	N/A	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	BD5	BD6	BD7	CA4	CA5
L		150 (5.91)			200 (7.87)	150 (5.91)		180 (7.09)	185 (7.28)	200 (7.87)		170 (6.69)			230 (9.06)	170 (6.69)			195 (7.68)	205 (8.07)	230 (9.06)
C		39.7 (1.56)										51.1 (2.01)									
D		127 (5.00)	155.4 (6.12)	155.4 (6.12)	177.8 (7.00)	150 (5.91)	170 (6.69)	170 (6.69)	155.4 (6.12)	177.8 (7.00)		152.4 (6.00)	165.1 (6.50)	165.1 (6.50)	215.9 (8.50)	165 (6.50)	180 (7.09)	195 (7.68)	195 (7.68)	165.1 (6.50)	215.9 (8.50)
H		303 (11.93)	317 (12.48)	317 (12.48)	328.5 (12.93)	314.5 (12.38)	324.5 (12.78)	325 (12.8)	317 (12.48)	328.5 (12.93)		337.5 (13.29)	344 (13.54)	344 (13.54)	369.5 (14.55)	344 (13.54)	351.5 (13.84)	359 (14.14)	359 (14.14)	344 (13.54)	369.5 (14.55)
H1		136 (5.35)										158 (6.22)									
T		17.5 (0.69)	20.6 (0.81)	28.8 (1.13)	38.2 (1.50)	18 (0.71)	26 (1.02)	28 (1.10)	28.8 (1.13)	38.2 (1.50)		19.1 (0.75)	22.4 (0.88)	31.8 (1.25)	44.5 (1.75)	20 (0.79)	26 (1.02)	28 (1.10)	30 (1.18)	33.3 (1.31)	46 (1.81)
J		98.6 (3.88)	114.3 (4.50)	114.3 (4.50)	124 (4.88)	110 (4.33)	125 (4.92)	125 (4.92)	114.3 (4.50)	124 (4.88)		120.7 (4.75)	127 (5.00)	127 (5.00)	165.1 (6.50)	125 (4.92)	135 (5.32)	145 (5.71)	145 (5.71)	127 (5.00)	165.1 (6.50)
N		4 (0.16)										4 (0.16)	8 (0.31)	8 (0.31)	8 (0.31)	4 (0.16)	4 (0.16)	4 (0.16)	4 (0.16)	8 (0.31)	8 (0.31)
G		15.7 (0.62)	22.4 (0.88)	22.4 (0.88)	28.4 (1.12)	18 (0.71)	22 (0.04)	22 (0.04)	22.4 (0.88)	28.4 (1.12)		19 (0.75)	19 (0.75)	19 (0.75)	25.4 (1.00)	18 (0.71)	22 (0.87)	26 (1.02)	26 (1.02)	19 (0.75)	25.4 (1.00)
WEIGHT	kg	8.1	9.3	11.3	16.2	8.8	12.7	12.7	11.7	16.3		11.7	13.2	14.8	26.5	11.3	14.3	15.2	15.2	15.8	26.9
	lb	17.86	20.51	24.92	35.72	19.40	28.00	28.00	25.80	35.94		25.80	29.11	32.63	58.43	24.92	31.52	33.50	33.50	34.84	59.31

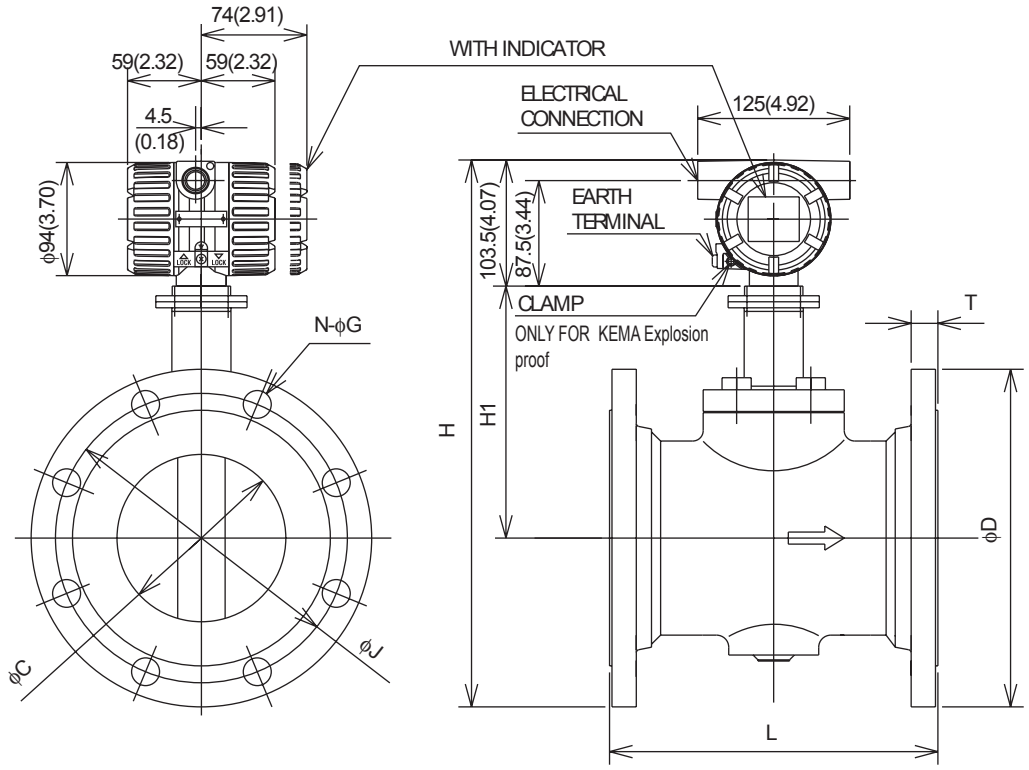
TYPE		INTEGRAL/REMOTE																				
CODE		DY080 (80mm, 3in)										DY100 (100mm, 4in)										
PROCESS CONNECTION		BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	BD5	BD6	BD7	CA4	CA5	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	BD5	BD6	BD7	CA4	CA5
L		200 (7.87)			245 (9.65)	200 (7.87)				230 (9.06)	235 (9.25)	250 (9.84)	220 (8.66)		240 (9.45)	280 (11.02)	220 (8.66)				260 (10.24)	270 (10.63)	285 (11.22)
C		71 (2.80)											93.8 (3.69)										
D		190.5 (7.50)	209.6 (8.25)	209.6 (8.25)	241.3 (9.50)	200 (7.87)	200 (7.87)	215 8.47)	230 (9.06)	230 (9.06)	209.6 (8.25)	241.3 (9.50)	228.6 (9.00)	254 (10.00)	273 (10.75)	292.1 (11.50)	220 (8.66)	235 (9.25)	250 (9.85)	265 (10.43)	265 (10.43)	273 (10.75)	292.1 (11.50)
H		374 (14.72)	383.5 (15.10)	383.5 (15.10)	399 (15.71)	378.5 (14.90)	378.5 (14.90)	386 (15.2)	393.5 (15.50)	394 (15.52)	383.5 (15.10)	399 (15.71)	409 (16.10)	420.5 (16.56)	430 (16.93)	439.5 (17.30)	403.5 (15.89)	411 (16.18)	418.5 (16.48)	426 (16.78)	426 (16.78)	430 (16.93)	439.5 (17.30)
H1		175 (6.89)											190 (7.48)										
T		23.9 (0.94)	28.4 (1.12)	38.2 (1.50)	44.5 (1.75)	20 (0.79)	24 (0.95)	28 (1.10)	32 (1.26)	36 (1.42)	39.7 (1.56)	46 (1.81)	23.9 (0.94)	31.8 (1.25)	44.5 (1.75)	50.9 (2.00)	20 (0.79)	24 (0.95)	30 (1.18)	36 (1.42)	40 (1.57)	46 (1.81)	52.4 (2.06)
J		152.4 (6.00)	168.2 (6.62)	168 (6.61)	190.5 (7.50)	160 (6.30)	160 (6.30)	170 (6.69)	180 (7.09)	180 (7.09)	170 (6.69)	180 (7.09)	190.5 (7.50)	200.2 (7.88)	216 (8.50)	235 (9.25)	180 (7.09)	190 (7.48)	200 (7.88)	210 (8.27)	210 (8.27)	216 (8.50)	235 (9.25)
N		4 (0.16)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)										
G		19 (0.75)	22.4 (0.88)	22.4 (0.88)	25.4 (1.00)	18 (0.71)	18 (0.71)	22 (0.04)	26 (1.02)	26 (1.02)	22.4 (0.88)	25.4 (1.00)	19 (0.75)	22.4 (0.88)	25.4 (1.00)	31.8 (1.25)	18 (0.71)	22 (0.87)	26 (1.02)	30 (1.18)	30 (1.18)	25.4 (1.00)	31.8 (1.25)
WEIGHT	kg	20	23.8	25.4	35.7	19.4	20	24.1	27	26	27.1	36.3	27.4	35.9	50.8	55.9	23.2	27.4	33	39.7	39.7	52.8	56.6
	lb	44.10	52.48	56.01	78.72	42.78	44.10	53.14	59.53	57.33	59.76	80.04	60.42	79.16	112.01	123.26	51.16	60.42	72.74	87.51	87.51	116.42	124.80

(Note 1) Integral weight is the same as Remote
(Note 2) In the case of with Indicator, add 0.2 kg
(Note 3) The flow direction is opposite (right to left when facing onto indicator) in case of code/ /CRC.

9. GENERAL DESCRIPTION

Flange type (DY150 up to DY300)

Unit: mm
(approx. inch)



TYPE		INTEGRAL/REMOTE																							
CODE		DY150 (150mm, 6in)											DY200 (200mm, 8in)												
PROCESS CONNECTION		BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	BD5	BD6	CA4	CA5	N/A	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1	BD2	BD3	BD4	CA4	CA5	N/A	N/A
L		270 (10.63)		310 (12.21)	336 (13.23)	270 (10.63)				325 (12.80)	340 (13.39)		310 (12.20)		370 (14.57)	386 (15.20)	310 (12.20)				375 (14.76)	390 (15.35)		
C		138.8 (5.46)											185.6 (7.31)											
D		279.4 (11.00)	317.5 (12.50)	356 (14.02)	381 (15.00)	285 (11.22)	300 (11.81)	345 (13.53)	355 13.93	356 (14.02)	381 (15.00)		342.9 (13.50)	381 (15.00)	419.1 (16.50))	469.9 (18.50))	340 (13.39))	340 (13.39))	360 (14.17))	375 (14.76))	419.1 (16.50))	469.9 (18.50))		
H		452 (17.80)	471 (18.54)	491 (19.33)	503 (19.80)	455 (17.91)	463 (18.23)	485 (19.02)	490 (19.22)	491 (19.33)	503 (19.80)		516 (20.31)	535 (21.06)	554 (21.81)	579 (22.80)	515 (20.28)	515 (20.28)	525 (20.67)	532 (20.94)	554 (21.81)	579 (22.80)		
H1		209 (8.23)											241 (9.49)											
T		25.4 (1.00)	36.6 (1.44)	54.4 (2.14)	62 (2.44)	22 (0.87)	28 (1.10)	36 (1.41)	44 (1.72)	55.7 (2.19)	63.6 (2.50)		28.4 (1.12)	41.1 (1.62)	62 (2.44)	69.9 (2.75)	24 (0.95)	24 (0.95)	30 (1.18)	34 (1.34)	63.6 (2.50)	71.4 (2.81)		
J		241.3 (9.50)	269.7 (10.62)	292 (11.50)	317.5 (12.50)	240 (9.45)	250 (9.84)	280 (10.98)	290 (11.38)	292 (11.50)	317.5 (12.50)		298.5 (11.75)	330.2 (13.00)	349.3 (13.75)	393.7 (15.50)	295 (11.61)	295 (11.61)	310 (12.20)	320 (12.60)	349.3 (13.75)	393.7 (15.50)		
N		8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	8 (0.31)	8 (0.31)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)		8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)		
G		22.4 (0.88)	22.4 (0.88)	28.4 (1.12)	31.8 (1.25)	22 (0.87)	26 (1.02)	33 (1.19)	33 (1.19)	28.4 (1.12)	31.8 (1.25)		22.4 (0.88)	25.4 (1.00)	31.8 (1.25)	38.1 (1.50)	22 (0.87)	22 (0.87)	26 (1.02)	30 (1.18)	31.8 (1.25)	38.1 (1.50)		
WEIGHT	kg	36.4	54.4	84.4	106	33.4	42.9	58.1	76.4	90	107		55.4	80.4	136	182	46.3	46.3	53.6	55.9	139	183		
	lb	80.26	119.95	186.10	233.73	73.65	94.59	128.07	168.41	198.45	235.94		122.16	177.28	299.88	401.31	102.09	102.09	118.19	123.26	306.52	403.52		

TYPE		INTEGRAL/REMOTE							
CODE		DY250 (250mm, 10in)				DY300 (300mm, 12in)			
PROCESS CONNECTION		BA1 BS1	BA2 BS2	N/A	N/A	BA1 BS1	BA2 BS2	N/A	N/A
L		370 (14.57)				400 (15.75)			
C		230.8 (9.09)				276.2 (10.87)			
D		406.4 (16.00)	444.5 (17.50)			482.6 (19.00)	520.7 (20.50)		
H		584 (22.99)	603 (23.74)			652 (25.67)	671 (26.42)		
H1		277 (10.91)				307 (12.09)			
T		31.2 (1.23)	48.8 (1.92)			32.8 (1.29)	51.8 (2.04)		
J		362 (14.25)	387.4 (15.25)			431.8 (17.00)	450.9 (17.75)		
N		12 (0.47)	16 (0.63)			12 (0.47)	16 (0.63)		
G		25.4 (1.00)	28.5 (1.12)			25.4 (1.00)	31.8 (1.25)		
WEIGHT	kg	90	125			140	178		
	lb	198.45	275.63			308.70	392.49		

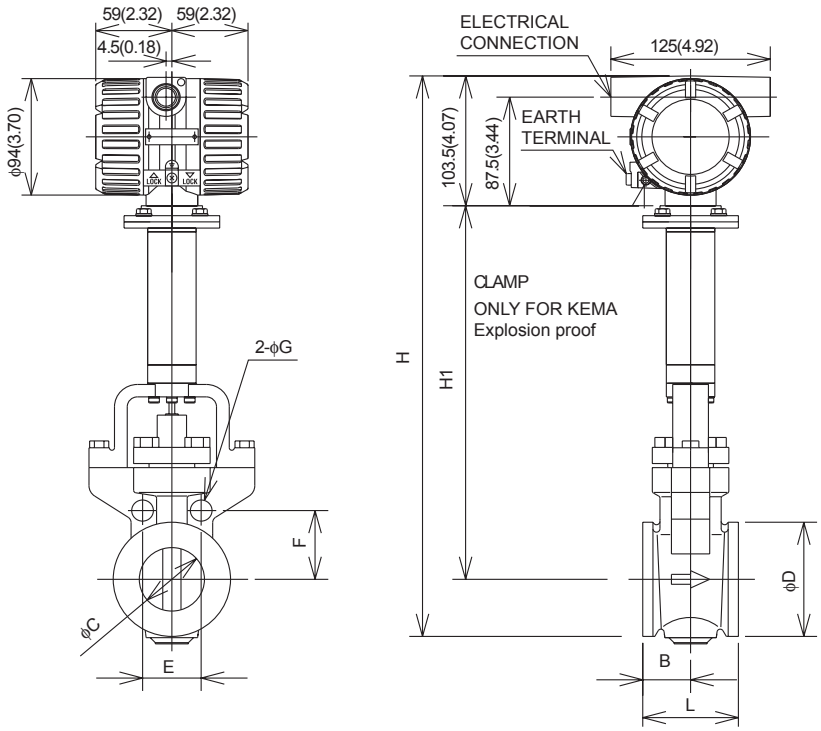
(Note 1) Integral weight is the same as Remote
(Note 2) In case of with indicator, add 0.2kg
(Note 3) The flow direction is opposite (right to left when facing onto indicator) in case of code / CRC.

High Process Temperature Version (/HT): DY025-/HT up to DY100-/HT

Cryogenic Version (/LT): DY015-/LT up to DY100-/LT

Wafer type

Unit: mm
(approx. inch)



TYPE	Only for REMOTE						
CODE	DY015 (15mm,½in) Only for /LT						
PROCESS CONNECTION	AA1	AA2	AA4	AD1 - AD4	N/A	N/A	N/A
L	70 (2.76)						
B	35 (1.38)						
C	14.6 (0.57)						
D	35.1 (1.38)						
H	391 (15.39)						
H1	270 (10.63)						
E	42.7 (1.68)	47.1 (1.85)	47.1 (1.85)	46 (1.81)			
F	21.4 (0.84)	23.5 (0.93)	23.5 (0.93)	23 (0.91)			
G	14 (0.55)	14 (0.55)	14 (0.55)	13 (0.51)			
WEIGHT kg	3.2 (7.06lb)						

TYPE	Only for REMOTE																						
CODE	DY025 (25mm,1in) /LT, /HT							DY040 (40mm,1½in) /LT, /HT							DY050 (50mm,2in) /LT, /HT						
PROCESS CONNECTION	AA1	AA2	AA4	AD1 - AD4	N/A	N/A	N/A	AA1	AA2	AA4	AD1 - AD4	N/A	N/A	N/A	AA1	AA2	AA4	AD1 - AD4	N/A	N/A	N/A
L	70 (2.76)							70 (2.76)							75 (2.95)						
B	35 (1.38)							35 (1.38)							37.5 (1.48)						
C	25.7 (1.01)							39.7 (1.56)							51.1 (2.01)						
D	50.8 (2.00)							73 (2.87)							92 (3.62)						
H	401 (15.79)							419 (16.50)							450.5 (17.74)						
H1	272 (10.71)							279 (10.98)							301 (11.85)						
E	56 (2.20)	62.9 (2.48)	62.9 (2.48)	60.1 (2.37)				69.7 (2.74)	80.8 (3.18)	80.8 (3.18)	77.8 (3.06)				(Note 1)	48.6 (1.91)	48.6 (1.91)	(Note 1)			
F	28 (1.10)	31.4 (1.24)	31.4 (1.24)	30.1 (1.19)				34.8 (1.37)	40.4 (1.59)	40.4 (1.59)	38.9 (1.53)				(Note 1)	58.7 (2.31)	58.7 (2.31)	(Note 1)			
G	14 (0.55)	17 (0.67)	17 (0.67)	13 (0.51)				14 (0.55)	20 (0.79)	20 (0.79)	17 (0.67)				(Note 1)	17 (0.67)	17 (0.67)	(Note 1)			
WEIGHT kg	4.1 (9.04lb)							4.7 (10.36lb)							6.4 (14.11lb)						

TYPE	Only for REMOTE														
CODE	DY080 (80mm,3in) /LT, /HT								DY100 (100mm,4in) /LT, /HT								
PROCESS CONNECTION	AA1	AA2	AA4	AD1 - AD2	AD3 - AD4	N/A	N/A	N/A	AA1	AA2	AA4	AD1 - AD2	AD3 - AD4	N/A	N/A	N/A
L	100 (3.94)								120 (4.72)							
B	40 (1.57)								50 (1.97)							
C	71 (2.80)								93.8 (3.69)							
D	127 (5.00)								157.2 (6.19)							
H	485 (19.09)								515 (20.28)							
H1	318 (12.52)								333 (13.11)							
E	(Note 1)	64.4 (2.54)	64.4 (2.54)	61.2 (2.41)	61.2 (2.41)				72.9 (2.87)	76.6 (3.02)	82.6 (3.25)	68.9 (2.71)	72.7 (2.86)			
F	(Note 1)	77.7 (3.06)	77.7 (3.06)	73.9 (2.91)	73.9 (2.91)				88 (3.46)	92.5 (3.64)	99.7 (3.93)	83.1 (3.27)	87.8 (3.46)			
G	(Note 1)	20 (0.79)	20 (0.79)	17 (0.67)	17 (0.67)				17 (0.67)	20 (0.79)	23 (0.91)	17 (0.67)	21 (0.83)			
WEIGHT kg	9.8 (21.61lb)								13.2 (29.11lb)							

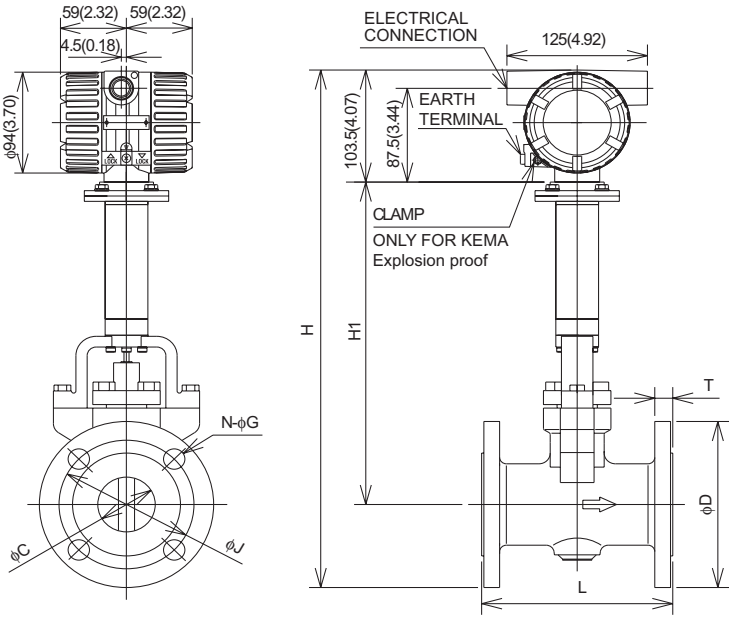
(Note 1) The hole is not provided.
(Note 2) The flow direction is opposite (right to left when facing onto indicator) in case of code / CRC.

High Process Temperature Version (/HT): DY025-/HT up to DY100-/HT

Cryogenic Version (/LT): DY015-/LT up to DY100-/LT

Flange type

Unit: mm
(approx. inch)



TYPE		INTEGRAL/REMOTE																				
CODE		DY015 (15mm, 1/2in) Only for /LT										DY025 (25mm, 2in) /LT, /HT										
PROCESS CONNECTION		BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	BD5 - BD6	BD7	CA4	CA5	N/A	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	BD5 - BD6	BD7	CA4	CA5	N/A	
L		130 (5.12)			160 (6.30)	130 (5.12)		140 (5.51)	140 (5.51)	160 (6.30)		150 (5.91)			190 (7.48)	150 (5.91)		170 (6.69)	170 (6.69)	190 (7.48)		
C		14.6 (0.57)										25.7 (1.01)										
D		88.9 (3.50)	95.3 (3.75)	95.3 (3.75)	120.7 (4.75)	95 (3.74)	105 (4.12)	105 (4.12)	95.3 (3.75)	120.7 (4.75)		108 (4.25)	124 (4.88)	124 (4.88)	149.4 (5.88)	115 (4.53)	140 (5.49)	140 (5.49)	124 (4.88)	149.4 (5.88)		
H		418 (16.46)	421 (16.57)	421 (16.57)	434 (17.09)	421 (16.57)	426 (16.71)	426 (16.71)	421 (16.57)	434 (17.09)		430 (16.93)	438 (17.24)	438 (17.24)	450 (17.72)	433 (17.05)	446 (15.50)	446 (15.50)	438 (17.24)	450 (17.18)		
H1		270 (10.63)										272 (10.71)										
T		11.2 (0.44)	14.2 (0.56)	21 (0.83)	28.8 (1.13)	16 (0.63)	20 (0.78	20 (0.78	19.9 (0.78)	28.8 (1.13)		14.2 (0.56)	17.5 (0.69)	24 (0.94)	34.9 (1.37)	18 (0.71)	24 (0.94)	24 (0.94)	24 (0.94)	34.9 (1.37)		
J		60.5 (2.38)	66.5 (2.62)	66.5 (2.62)	82.6 (2.25)	65 (2.56)	75 (2.94)	75 (2.94)	66.5 (2.62)	82.6 (2.25)		79.2 (3.12)	89 (3.50)	89 (3.50)	101.6 (4.00)	85 (3.35)	100 (3.92)	100 (3.92)	89 (3.50)	101.6 (4.00)		
N		4 (0.16)										4 (0.16)										
G		15.7 (0.62)	15.7 (0.62)	15.7 (0.62)	22.4 (0.88)	14 (0.55)	14 (0.55)	14 (0.55)	15.7 (0.62)	22.4 (0.88)		15.7 (0.62)	19 (0.75)	19 (0.75)	25.4 (1.00)	14 (0.55)	18 (0.71)	18 (0.71)	19 (0.75)	25.4 (1.00)		
WEIGHT	kg	4.5	4.7	5.0	7.1	4.6	5.8	5.8	4.9	7.2		7.0	7.6	8.1	11.5	7.3	10.0	10.0	8.3	11.8		
	lb	9.92	10.36	11.03	15.66	10.14	12.79	12.79	10.80	15.88		15.44	16.76	17.86	25.36	16.10	22.05	22.05	18.30	26.02		

TYPE		INTEGRAL/REMOTE																				
CODE		DY040 (40mm, 1 1/2in) /LT, /HT										DY050 (50mm, 2in) /LT, /HT										
PROCESS CONNECTION		BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	BD5 - BD6	BD7	CA4	CA5	N/A	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	BD5	BD6	BD7	CA4	CA5	
L		150 (5.91)			200 (7.87)	150 (5.91)		180 (7.06)	185 (7.28)	200 (7.87)		170 (6.69)			230 (9.06)	170 (6.69)			195 (7.65)	205 (8.07)	230 (9.06)	
C		39.7 (1.56)										51.1 (2.01)										
D		127 (5.00)	155.4 (6.12)	155.4 (6.12)	177.8 (7.00)	150 (5.91)	170 (6.67)	170 (6.67)	155.4 (6.12)	177.8 (7.00)		152.4 (6.00)	165.1 (6.50)	165.1 (6.50)	215.9 (8.50)	165 (6.50)	180 (7.06)	195 (7.65)	195 (7.65)	165.1 (6.50)	215.9 (8.50)	
H		446 (17.56)	460 (18.11)	460 (18.11)	472 (18.58)	458 (18.03)	468 (18.36)	468 (18.36)	460 (18.11)	472 (18.58)		481 (18.94)	487 (19.17)	487 (19.17)	513 (20.20)	487 (19.17)	495 (19.42)	502 (19.69)	502 (19.69)	487 (19.17)	513 (20.20)	
H1		279 (10.98)										301 (11.85)										
T		17.5 (0.69)	20.6 (0.81)	28.8 (1.13)	38.2 (1.50)	18 (0.71)	26 (1.02)	26 (1.02)	28.8 (1.13)	38.2 (1.50)		19.1 (0.75)	22.4 (0.88)	31.8 (1.25)	44.5 (1.75)	20 (0.79)	26 (1.02)	28 (1.10)	28 (1.10)	33.3 (1.31)	46 (1.81)	
J		98.6 (3.88)	114.3 (4.50)	114.3 (4.50)	124 (4.88)	110 (4.33)	125 (4.90)	125 (4.90)	114.3 (4.50)	124 (4.88)		120.7 (4.75)	127 (5.00)	127 (5.00)	165.1 (6.50)	125 (4.92)	135 (5.30)	145 (5.69)	145 (5.69)	127 (5.00)	165.1 (6.50)	
N		4 (0.16)										4 (0.16)	8 (0.31)	8 (0.31)	8 (0.31)	4 (0.16)	4 (0.16)	4 (0.16)	4 (0.16)	8 (0.31)	8 (0.31)	
G		15.7 (0.62)	22.4 (0.88)	22.4 (0.88)	28.4 (1.12)	18 (0.71)	22 (0.86)	22 (0.86)	22.4 (0.88)	28.4 (1.12)		19 (0.75)	19 (0.75)	19 (0.75)	25.4 (1.00)	18 (0.71)	22 (0.86)	26 (1.02	26 (1.02	19 (0.75)	25.4 (1.00)	
WEIGHT	kg	8.5	9.7	11.7	16.6	9.2	13.1	13.1	12.1	16.7		12.1	13.6	15.2	26.9	11.7	14.7	15.6	15.6	16.2	27.3	
	lb	18.74	21.39	25.80	36.60	20.29	28.88	28.88	26.68	36.82		26.68	29.99	33.52	59.32	25.80	32.41	34.40	34.40	35.72	60.20	

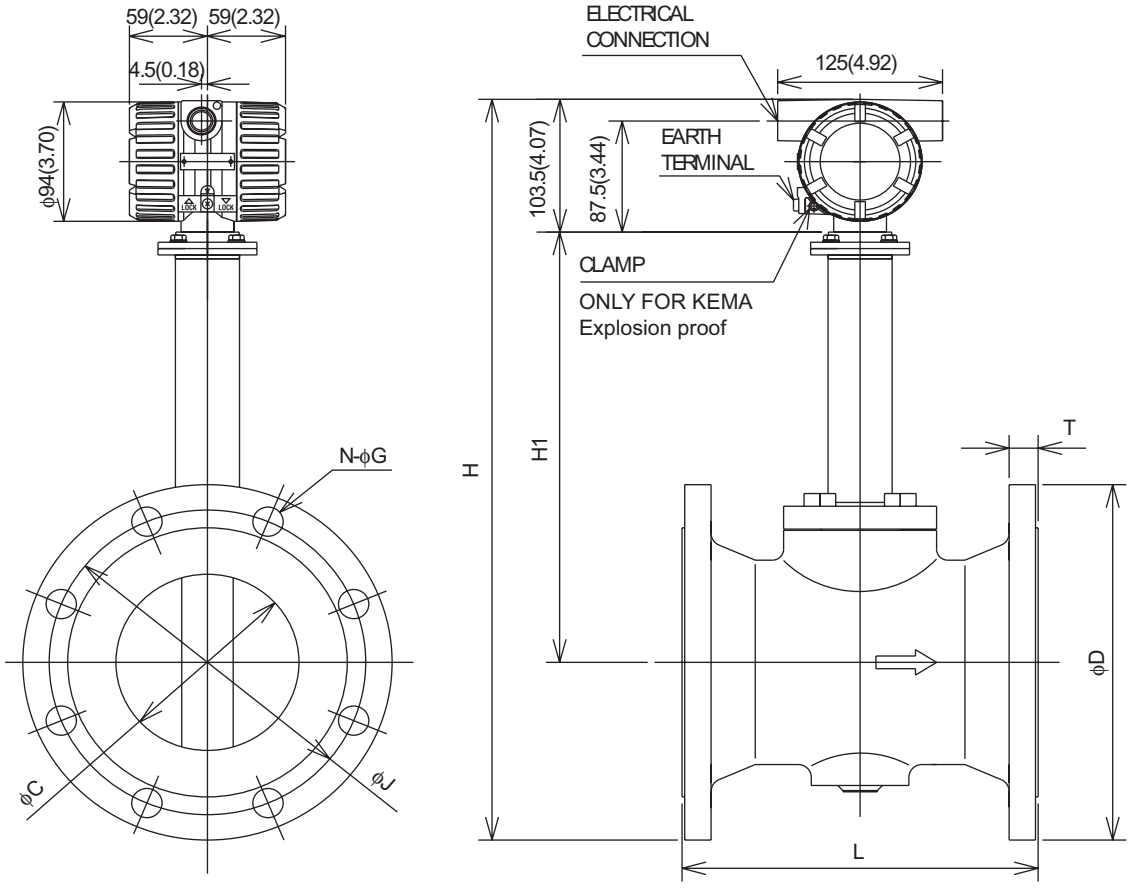
TYPE		INTEGRAL/REMOTE																				
CODE		DY080 (80mm, 3in) /LT, /HT										DY100 (100mm, 4in) /LT, /HT										
PROCESS CONNECTION		BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	BD5	BD6	BD7	CA4	CA5	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	BD5	BD6	BD7	CA4	CA5
L		200 (7.87)			245 (9.65)	200 (7.87)				230 (9.06)	235 (9.25)	250 (9.84)	220 (8.66)		240 (9.45)	280 (11.02)	220 (8.66)				260 (10.2)	270 (10.63)	285 (11.22)
C		71 (2.80)											93.8 (3.69)										
D		190.5 (7.50)	209.6 (8.25)	209.6 (8.25)	241.3 (9.50)	200 (7.87)	200 (7.87)	215 (8.53)	230 (9.02)	230 (9.02)	209.6 (8.25)	241.3 (9.50)	228.6 (9.00)	254 (10.00)	273 (10.75)	292.1 (11.50)	220 (8.66)	235 (9.25)	250 (9.81)	265 (10.40)	265 (10.40)	273 (10.75)	292.1 (11.50)
H		517 (20.35)	527 (20.75)	527 (20.75)	542 (21.34)	522 (20.55)	522 (20.55)	529 (20.75)	537 (21.07)	537 (21.07)	527 (20.75)	542 (21.34)	552 (21.73)	564 (22.20)	573 (22.56)	583 (22.95)	547 (21.54)	554 (21.81)	562 (22.04)	569 (22.32)	569 (22.32)	573 (22.56)	583 (22.95)
H1		318 (12.52)											333 (13.11)										
T		23.9 (0.94)	28.4 (1.12)	38.2 (1.50)	44.5 (1.75)	20 (0.79)	24 (0.94)	28 (1.10)	32 (1.25)	36 (1.41)	39.7 (1.56)	46 (1.81)	23.9 (0.94)	31.8 (1.25)	44.5 (1.75)	50.9 (2.00)	20 (0.79)	24 (0.94)	30 (1.18)	36 (1.41)	40 (1.57)	46 (1.81)	52.4 (2.06)
J		152.4 (6.00)	168.2 (6.62)	168 (6.61)	190.5 (7.50)	160 (6.30)	160 (6.30)	170 (6.69)	180 (7.09)	180 (7.09)	170 (6.69)	180 (7.09)	190.5 (7.50)	200.2 (7.88)	216 (8.50)	235 (9.25)	180 (7.09)	190 (7.48)	200 (7.85)	210 (8.24)	210 (8.24)	216 (8.50)	235 (9.25)
N		4 (0.16)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)										
G		19 (0.75)	22.4 (0.88)	22.4 (0.88)	25.4 (1.00)	18 (0.71)	18 (0.71)	22 (0.86)	26 (1.02)	26 (1.02)	22.4 (0.88)	25.4 (1.00)	19 (0.75)	22.4 (0.88)	25.4 (1.00)	31.8 (1.25)	18 (0.71)	22 (0.87)	26 (1.02)	30 (1.18)	30 (1.18)	25.4 (1.00)	31.8 (1.25)
WEIGHT	kg	20.4	24.2	25.8	36.1	19.8	20.4	24.5	27.4	27.4	27.5	36.7	27.7	36.3	51.2	56.3	23.6	27.8	33.4	40.1	40.1	53.2	57.0
	lb	44.98	53.36	56.89	79.60	43.66	44.98	54.02	40.41	40.41	60.64	80.92	61.30	80.04	112.90	124.14	52.04	61.30	73.64	88.42	88.42	117.31	125.69

(Note 1) The flow direction is opposite (right to left when facing onto indicator) in case of code / CRC.

High Process Temperature Version (/HT): DY150-/HT up to DY200-/HT

Flange type

Unit: mm
(approx. inch)

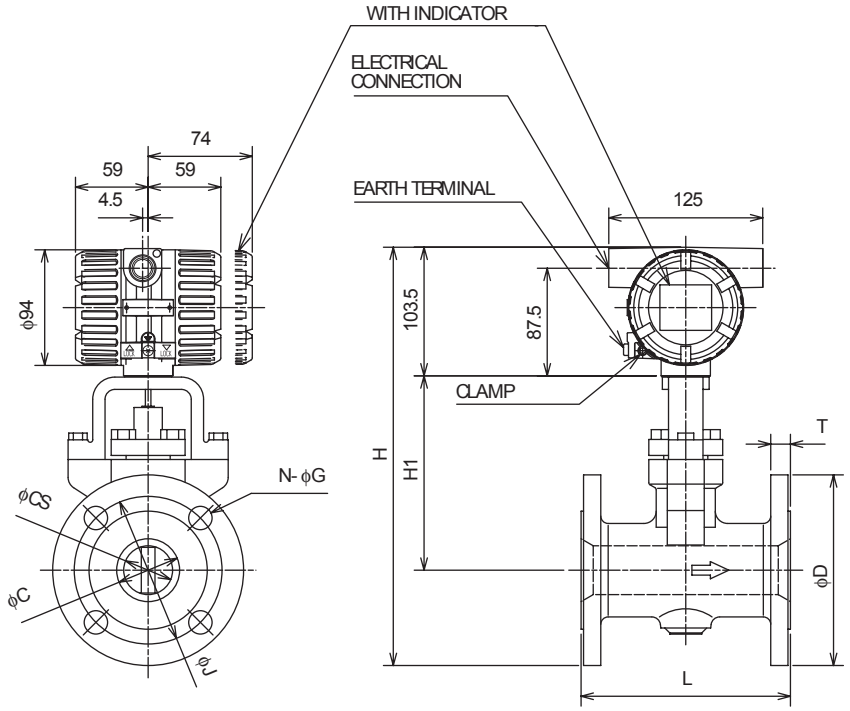


TYPE		INTEGRAL/REMOTE																						
CODE		DY150 (150mm,6in) / HT											DY200 (200mm,8in) / HT											
PROCESS CONNECTION		BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	BD5	BD6	CA4	CA5	N/A	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1	BD2	BD3	BD4	CA4	CA5	N/A	N/A
L		270 (10.63)		310 (12.20)	336 (13.23)	270 (10.63)				325 (12.80)	340 (13.39)		310 (12.20)		370 (14.57)	386 (15.20)	310 (12.20)				375 (14.77)	390 (15.35)		
C		138.8 (5.46)											185.6 (7.31)											
D		279.4 (11.00)	317.5 (12.50)	356 (14.02)	381 (15.00)	285 (11.22)	300 (11.81)	345 (13.37)	355 (13.76)	356 (14.02)	381 (15.00)		342.9 (13.50)	381 (15.00)	419.1 (16.50)	469.9 (18.50)	340 (13.39)	340 (13.39)	360 (14.17)	375 (14.76)	419.1 (16.50)	469.9 (18.50)		
H		582 (22.91)	601 (23.66)	621 (24.45)	633 (24.92)	585 (23.03)	593 (23.35)	615 (23.83)	620 (24.02)	621 (24.45)	633 (24.92)		646 (25.43)	665 (26.18)	684 (26.93)	709 (27.91)	645 (25.39)	645 (25.39)	655 (25.79)	662 (26.06)	684 (26.93)	709 (27.91)		
H1		339 (13.35)											371 (14.61)											
T		25.4 (1.00)	36.6 (1.44)	54.4 (2.14)	62 (2.44)	22 (0.87)	28 (1.10)	36 (1.39)	44 (1.71)	55.7 (2.19)	63.6 (2.50)		28.4 (1.12)	41.1 (1.62)	62 (2.44)	69.9 (2.75)	24 (0.95)	24 (0.95)	30 (1.18)	34 (1.34)	63.6 (2.50)	71.4 (2.81)		
J		241.3 (9.50)	269.7 (10.62)	292 (11.50)	317.5 (12.50)	240 (9.45)	250 (9.84)	280 (10.85)	290 (11.24)	292 (11.50)	317.5 (12.50)		298.5 (11.75)	330.2 (13.00)	349.3 (13.75)	393.7 (15.50)	295 (11.61)	295 (11.61)	310 (12.20)	320 (12.60)	349.3 (13.75)	393.7 (15.50)		
N		8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	8 (0.31)	8 (0.31)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)		8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)		
G		22.4 (0.88)	22.4 (0.88)	28.4 (1.12)	31.8 (1.25)	22 (0.87)	26 (1.02)	33 (1.28)	33 (1.28)	28.4 (1.12)	31.8 (1.25)		22.4 (0.88)	25.4 (1.00)	31.8 (1.25)	38.1 (1.50)	22 (0.87)	22 (0.87)	26 (1.02)	30 (1.18)	31.8 (1.25)	38.1 (1.50)		
WEIGHT	kg	36.4	54.4	84.4	106	33.4	42.9	58.1	76.4	90	107		55.4	80.4	136	182	46.3	46.3	53.6	55.9	139	183		
	lb	80.26	119.95	186.10	233.73	73.65	94.59	128.10	168.45	198.45	235.94		122.16	177.28	299.88	401.31	102.09	102.09	118.19	123.26	306.50	403.52		

(Note 1) The flow direction is opposite (right to left when facing onto indicator) in case of code / CRC.

Reduced Bore Type (/R1): DY025-/R1 up to DY150-/R1

Flange type



Model Code	DY025 /R1			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	150			
C	25.7			
CS	14.6			
D	108	124		
H	284.5	292.5		
H1	127			
T	14.2	17.5		
J	79.2	89		
N	4			
G	15.7	19		
Weight kg	5.5	7.0		

Model Code	DY040 /R1			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	150			
C	39.7			
CS	25.7			
D	127	155.4		
H	296	310		
H1	129			
T	17.5	20.6		
J	98.6	114.3		
N	4			
G	15.7	22.4		
Weight kg	9.4	12.6		

Model Code	DY050 /R1			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	170			
C	51.1			
CS	39.7			
D	152.4	165.1		
H	315.5	322		
H1	136			
T	19.1	22.4		
J	120.7	127		
N	4	8		
G	19	19		
Weight kg	11.4	13.6		

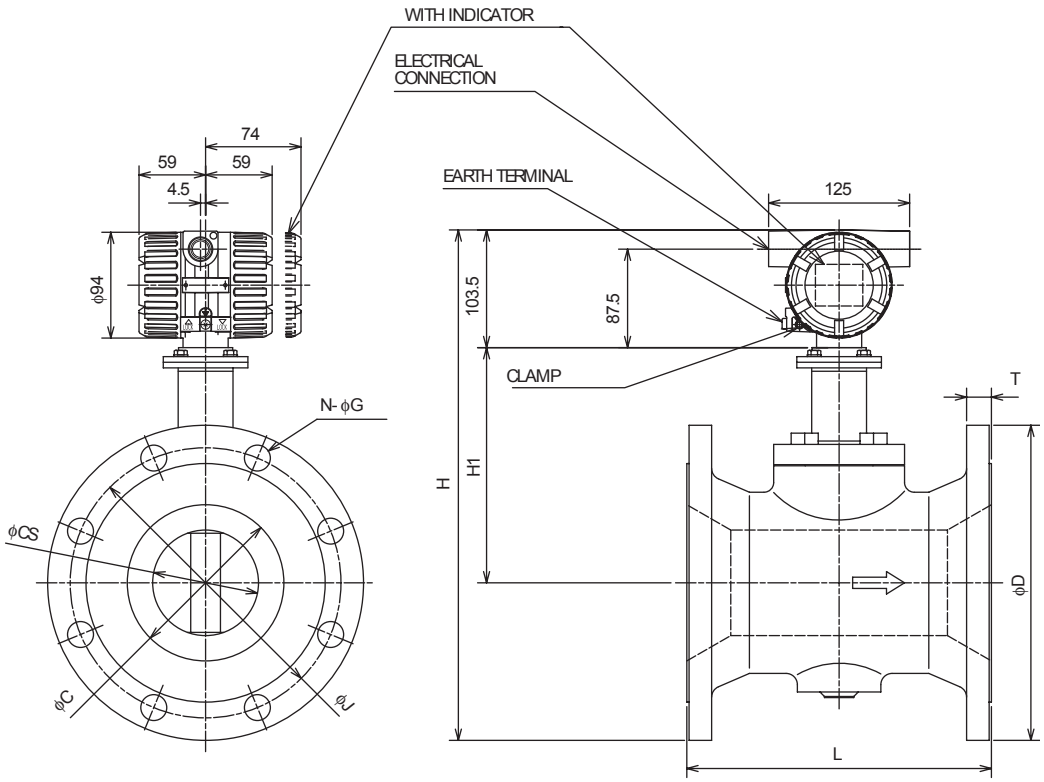
Model Code	DY080 /R1			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	200			
C	71			
CS	51.1			
D	190.5	209.6		
H	357	366.5		
H1	158			
T	23.9	28.4		
J	152.4	168.2		
N	4	8		
G	19	22.4		
Weight kg	21.9	26.9		

Model Code	DY100 /R1			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	220			
C	93.8			
CS	71			
D	228.6	254		
H	393	405.5		
H1	175			
T	23.9	31.8		
J	190.5	200.2		
N	8			
G	19	22.4		
Weight kg	30.6	41.0		

Model Code	DY150 /R1			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	270			
C	138.8			
CS	93.8			
D	279.4	317.5		
H	433	452		
H1	190			
T	25.4	36.6		
J	241.3	269.7		
N	8	12		
G	22.4	22.4		
Weight kg	49.4	71.7		

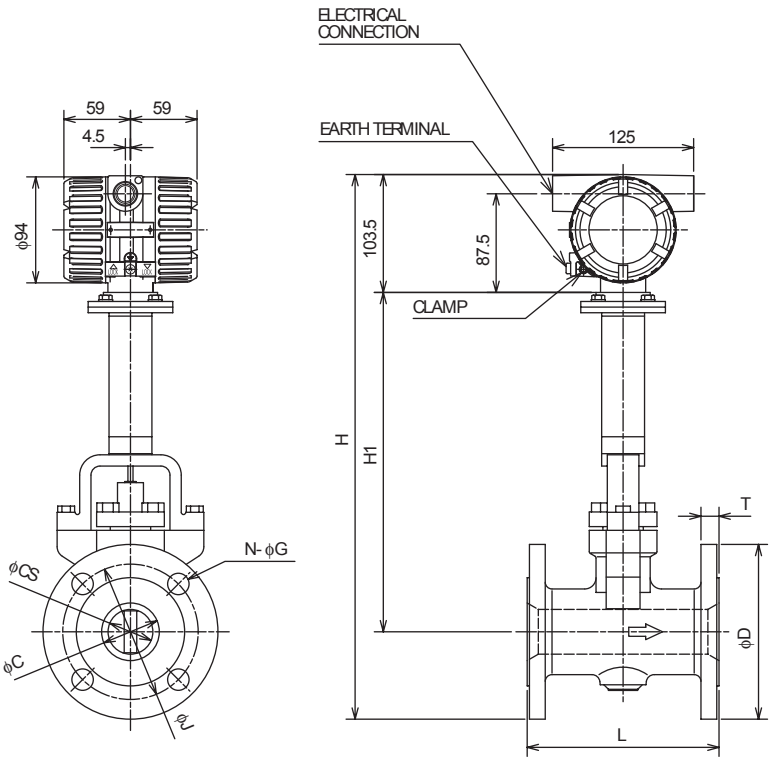
Reduced Bore Type (/R1): DY200-/R1

Flange type



Model Code	DY200 /R1			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	310			
C	185.6			
CS	138.8			
D	342.9	381		
H	484	503		
H1	209			
T	28.4	41.1		
J	298.5	330.2		
N	8	12		
G	22.4	25.4		
Weight kg	70.7	102.9		

High Process Temperature Version Reduced Bore Type (/R1/HT): DY040-/HT/R1 up to DY150-/R1/HT
Flange type



Model Code	DY040 /R1/HT			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	150			
C	39.7			
CS	25.7			
D	127	155.4		
H	439	453		
H1	272			
T	17.5	20.6		
J	98.6	114.3		
N	4			
G	15.7	22.4		
Weight kg	9.8	13.0		

Model Code	DY050 /R1/HT			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	170			
C	51.1			
CS	39.7			
D	152.4	165.1		
H	458.5	465		
H1	279			
T	19.1	22.4		
J	120.7	127		
N	4	8		
G	19	19		
Weight kg	11.8	14.0		

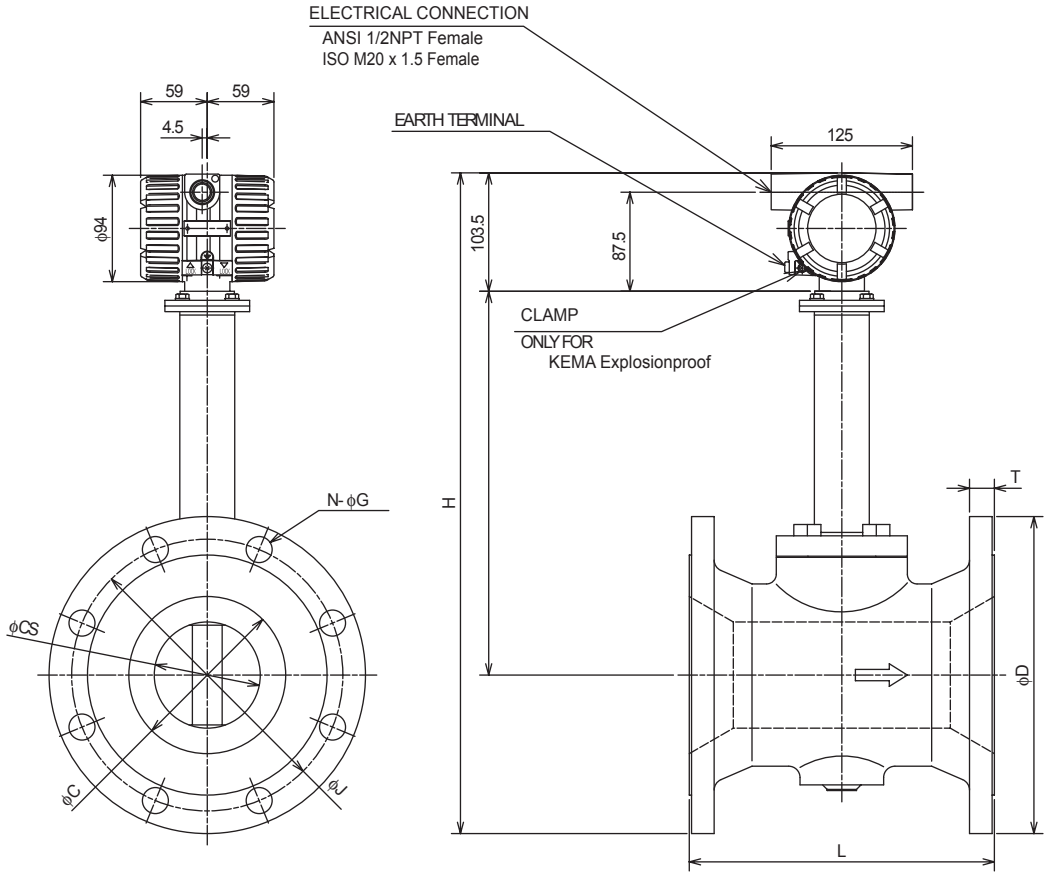
Model Code	DY080 /R1/HT			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	200			
C	71			
CS	51.1			
D	190.5	209.6		
H	500	509.5		
H1	301			
T	23.9	28.4		
J	152.4	168.2		
N	4	8		
G	19	22.4		
Weight kg	22.3	27.3		

Model Code	DY100 /R1/HT			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	220			
C	93.8			
CS	71			
D	228.6	254		
H	536	548.5		
H1	318			
T	23.9	31.8		
J	190.5	200.2		
N	8			
G	19	22.4		
Weight kg	31.0	41.4		

Model Code	DY150 /R1/HT			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	270			
C	138.8			
CS	93.8			
D	279.4	317.5		
H	576	595.5		
H1	333			
T	25.4	36.6		
J	241.3	269.7		
N	8	12		
G	22.4	22.4		
Weight kg	49.4	71.7		

High Process Temperature Version Reduced Bore Type (/R1/HT): DY200-/R1/HT

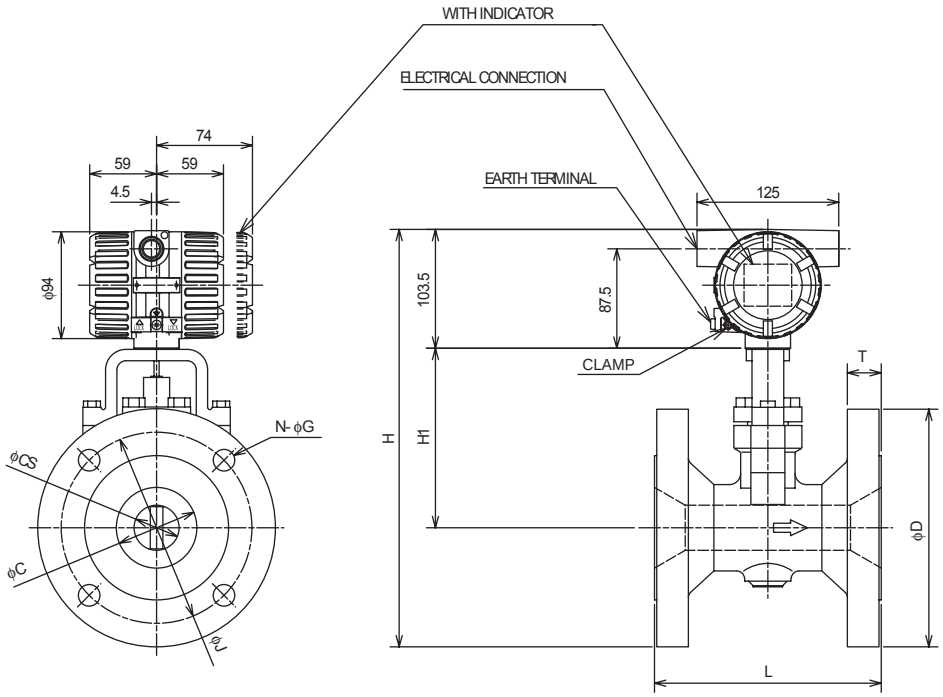
Flange type



Model Code	DY200/R1/HT			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	310			
C	185.6			
CS	138.8			
D	342.9	381		
H	614	633		
H1	339			
T	28.4	41.1		
J	298.5	330.2		
N	8	12		
G	22.4	25.4		
Weight kg	70.7	102.9		

Reduced Bore Type (/R2): DY040-/R2 up to DY200-/R2

Flange type



Model Code	DY040/R2			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	150			
C	39.7			
CS	14.6			
D	127	155.4		
H	294.0	308.2		
H1	127			
T	17.5	20.6		
J	98.6	114.3		
N	4			
G	15.7	22.4		
Weight kg	7.6	8.8		

Model Code	DY050/R2			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	170			
C	51.1			
CS	25.7			
D	152.4	165.1		
H	308.7	315.1		
H1	129			
T	19.1	22.4		
J	120.7	127		
N	4	8		
G	19			
Weight kg	10.6	12.1		

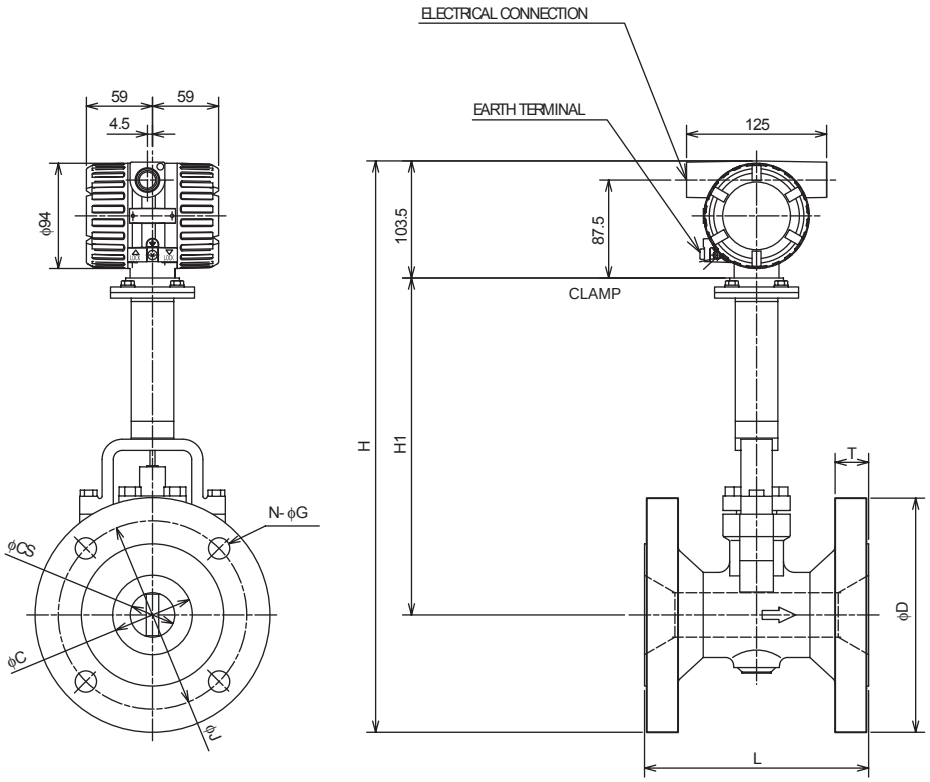
Model Code	DY080/R2			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	200			
C	71			
CS	39.7			
D	190.5	209.6		
H	334.8	344.3		
H1	136			
T	23.9	28.4		
J	152.4	168.2		
N	4	8		
G	19	22.4		
Weight kg	16.2	20		

Model Code	DY100/R2			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	220			
C	93.8			
CS	51.1			
D	228.6	254		
H	375.8	388.5		
H1	158			
T	23.9	31.8		
J	190.5	200.2		
N	8			
G	19	22.4		
Weight kg	25.5	34		

Model Code	DY150/R2			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	270			
C	138.8			
CS	71			
D	279.4	317.5		
H	418.2	437.3		
H1	175			
T	25.4	36.6		
J	241.3	269.7		
N	8	12		
G	22.4	22.4		
Weight kg	43.3	61.3		

Model Code	DY200/R2			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	310			
C	185.6			
CS	93.8			
D	342.9	381		
H	465.0	484		
H1	190			
T	28.4	41.1		
J	298.5	330.2		
N	8	12		
G	22.4	25.4		
Weight kg	71.9	96.9		

High Process Temperature Version Reduced Bore Type (/R2/HT): DY050-/R2/HT up to DY200-/R2/HT



Model Code	DY050/R2/HT			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	170			
C	51.1			
CS	25.7			
D	152.4	165.1		
H	451.7	458.1		
H1	272			
T	19.1	22.4		
J	120.7	127		
N	4	8		
G	19			
Weight kg	11	12.5		

Model Code	DY080/R2/HT			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	200			
C	71			
CS	39.7			
D	190.5	209.6		
H	477.8	487.3		
H1	279			
T	23.9	28.4		
J	152.4	168.2		
N	4	8		
G	19	22.4		
Weight kg	16.6	20.4		

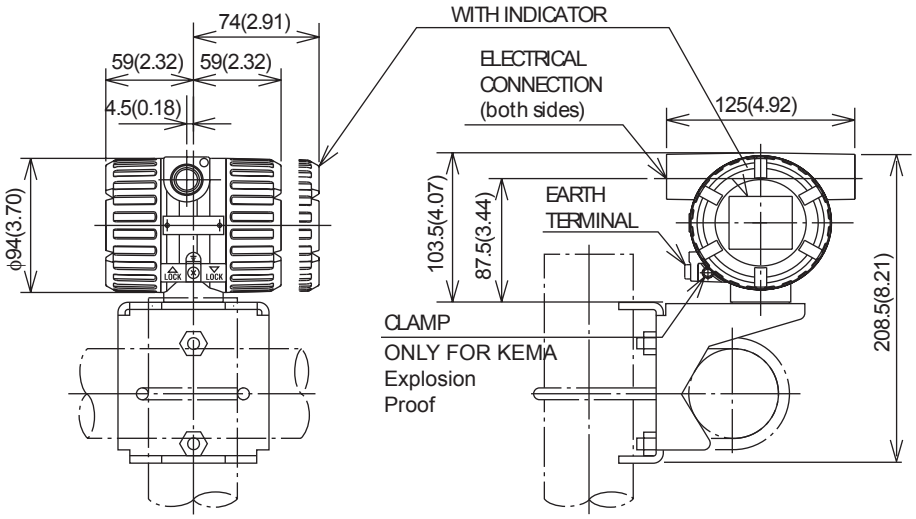
Model Code	DY100/R2/HT			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	220			
C	93.8			
CS	51.1			
D	228.6	254		
H	518.8	531.5		
H1	301			
T	23.9	31.8		
J	190.5	200.2		
N	8			
G	19	22.4		
Weight kg	25.9	34.4		

Model Code	DY150/R2/HT			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	270			
C	138.8			
CS	71			
D	279.4	317.5		
H	561.2	580.3		
H1	318			
T	25.4	36.6		
J	241.3	269.7		
N	8	12		
G	22.4	22.4		
Weight kg	43.3	61.3		

Model Code	DY200/R2/HT			
Process Connection	BA1 BS1 BP1	BA2 BS2 BP2	N/A	N/A
L	310			
C	185.6			
CS	93.8			
D	342.9	381		
H	608	627		
H1	333			
T	28.4	41.1		
J	298.5	330.2		
N	8	12		
G	22.4	25.4		
Weight kg	71.9	96.9		

Remote Type Converter (DYA)

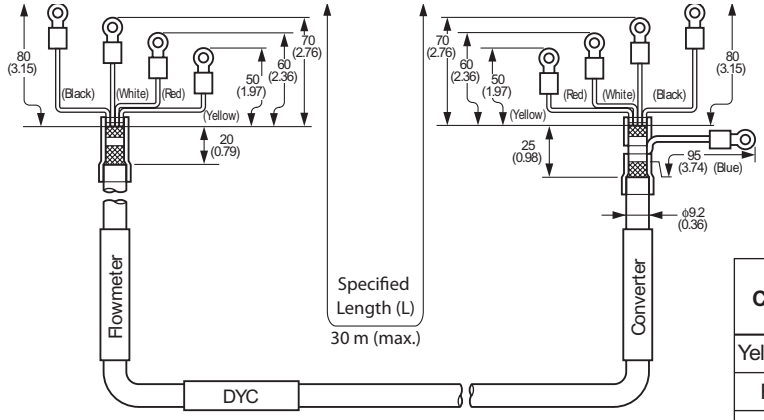
Unit: mm
(approx. inch)



Weight: 1.9 kg (4.19 lb)
Note: For flowmeters with indicator, add 0.2 kg (0.44 lb)

Signal Cable for Remote Type (DYC)

Unit: mm
(approx. inch)



Cable Color and Terminal

Color	Terminal	
	Flow meter	Converter
Yellow(*1)	T	T
Red	A	A
White	B	B
Black	⏚	C
Blue		⏚

(*1) Only for /MV

10. EXPLOSION PROTECTED TYPE INSTRUMENT

In this section, further requirements and differences for explosion proof type instrument are described except JIS Flame proof. For explosion proof type instrument, the description in this chapter is prior to other description in this Instruction Manual.

WARNING

- Only trained persons use this instrument in industrial locations.

10.1 ATEX

WARNING

Only trained persons use this instrument in industrial locations.

10.1.1 Technical Data

• Explosion proof

Applicable Standard : EN50014: 1997, EN50018: 2000
EN60529: 1991
Certificate : KEMA 01ATEX2072
Type of protection: EEx d IIC T6…T1 (Integral Type Flowmeter and Remote Type Flowmeter)
EEx d IIC T6 (Remote Type Converter)
Groups: Group II
Category: Category 2G
Temperature Code: (Integral Type Flowmeter and Remote Type Flowmeter)

Temperature Class	Ambient Temperature	Process Temperature
T6	60°C	85°C
T5	60°C	100°C
T4	60°C	135°C
T3	60°C	200°C
T2 *1	60°C	300°C
T1 *1	60°C	450°C

T100101-1.eps

*1 Note: Use /HT version above 260°C

Temperature Class: T6 (Remote Type Converter)
Degree of Protection of Enclosure: IP67
Tamb: -29 to +60°C (Integral Type Flowmeter and Remote Type Flowmeter)
-30 to +60°C (Remote Type Converter)
-29 to +60°C (Integral Type Flowmeter with indicator)
-30 to +60°C (Remote Type Converter with indicator)
Ambient Humidity: 0 to 100%RH
Power Supply: 42Vdc max.
Output Signal: Current Output; 4 to 20mAdc
Pulse output; On=2Vdc, 200mA
Off=42Vdc, 4mA
Maximum Working Pressure: 16MPa(DY015 to DY200)
5MPa(DY200 and DY300)
Coating of Enclosure: Epoxy resin coating or Polyurethane resin coating
Electrical Connection: ANSI 1/2 NPT female,
ISO M20 X 1.5 female

• Intrinsically Safe

Applicable Standard : EN50014: 1997, EN50020: 1994
EN60529: 1991
Certificate : KEMA 01ATEX1082X
Type of protection: EEx ia IIC T4…T1 (Integral Type Flowmeter and Remote Type Flowmeter)
EEx d IIC T4 (Remote Type Converter)
Groups: Group II
Category: Category 1G
Maximum Working Pressure: 16MPa (DY015 to DY200)
5MPa (DY250 and DY300)
Tamb. (Integral Type Flowmeter): -29 to +60°C
Tamb. (Remote Type Flowmeter): -29 to +80°C
Tamb. (Remote Type Converter): -40 to +60°C
Ambient Humidity: 0 to 100%RH (No condensation)
(Integral Type Flowmeter)

Temperature Class	Ambient Temperature	Process Temperature
T4	60°C	135°C
T3	60°C	200°C
T2*	60°C	300°C
T1*	60°C	450°C

T100101-2.eps

*: Use /HT version above 260°C

(Remote Type Flowmeter)

Temperature Class	Ambient Temperature	Process Temperature
T4	80°C	135°C
T3	80°C	20°0C
T2*	80°C	300°C
T1*	80°C	450°C

T100101-3.eps

*: Use /HT version above 260°C

For connection to certified Intrinsically Safe circuit with Signal/Supply and Pulse circuit of DY(/HT) and DYA :
Ui =30V dc, Ii=165mAdc, Pi= 0.9W, Ci= 6nF, Li= 0.15mH

Connect sensor circuit of DYA to DY-N(/HT) :
Maximum cable capacitance: 160nF
Electrical Connection: ANSI 1/2 NPT female, ISO M20 X 1.5 female

IM 01R06A00-01E-E
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• Type of Protection "n"

Applicable Standard: EN60079-15: 2003
IEC60079-0: 1998
IEC60079-11: 1999

Type of protection: EEx nL IIC T4…T1 (Integral Type Flowmeter and Remote Type Flowmeter)
EEx nL IIC T4 (Remote Type Converter)

Groups: Group II

Category: Category 3G

Maximum Working Pressure: 42MPa

Tamb. (Integral Type Flowmeter): -29 to +60°C

Tamb. (Remote Type Flowmeter): -29 to +80°C

Tamb. (Remote Type Converter): -40 to +60°C

Ambient Humidity: 0 to 100%RH (No condensation)

(Integral Type Flowmeter)

Temperature Class	Ambient Temperature	Process Temperature
T4	60°C	135°C
T3	60°C	200°C
T2*	60°C	300°C
T1*	60°C	45°0C

T100101-4.eps

*: Use /HT version above 260°C

(Remote Type Flowmeter)

Temperature Class	Ambient Temperature	Process Temperature
T4	80°C	135°C
T3	80°C	200°C
T2*	80°C	300°C
T1*	80°C	450°C

T100101-5.eps

*: Use /HT version above 260°C

Degree of protection of enclosure: IP67

Electrical data

Signal/Supply and Pulse circuit

Ui= 30Vdc, Ci= 6nF, Li= 0.15mH

Sensor circuit only for connection to DY-N(/HT) series

Maximum capacitance of cable: 160nF

Connect to DYA series only

Electrical Connection: ANSI 1/2 NPT female, ISO M20 X 1.5 female

10.1.2 Installation

WARNING

- All wiring shall comply with local installation requirements and local electrical code.
- Suitable heat-resisting cables shall be used for the digitalYEWFLO Model DY Series Vortex Flowmeter when the ambient temperature exceeds +70°C and/or the process temperature exceeds 135°C.
- The cable entry devices shall be certified in type of protection flame proof enclosure "d" and suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with certified blanking elements in type of protection flame proof enclose "d".

10.1.3 Operation

WARNING

- Wait 10 min. after power is turned off, before opening the covers.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

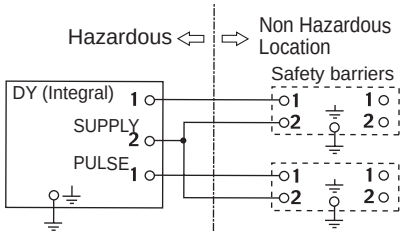
10.1.4 Maintenance and Repair

WARNING

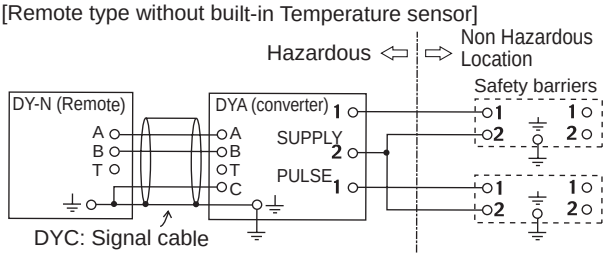
- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

10.1.5 Installation Diagram of Intrinsically safe (and Note)

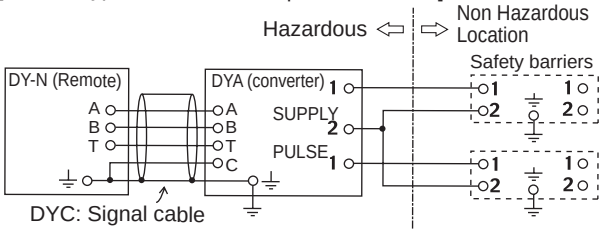
[Integral type]



[Remote type without built-in Temperature sensor]



[Remote type with built-in Temperature sensor]



Note: In any safety barrier used output current must be limited by a resistor 'R' such that Io=Uo/R

Electric data:
Supply and Output Circuit (SUPPLY **1** and **2**, PULSE**1** and **2**)
Maximum Input Voltage Ui: 30V
Maximum Input Current Ii: 165mA
Maximum Input Power Pi: 0.9W
Internal Capacitance Ci: 6nF
Internal Inductance Li: 0.15mH

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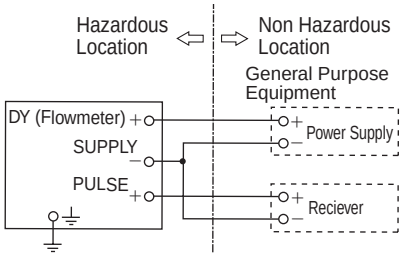
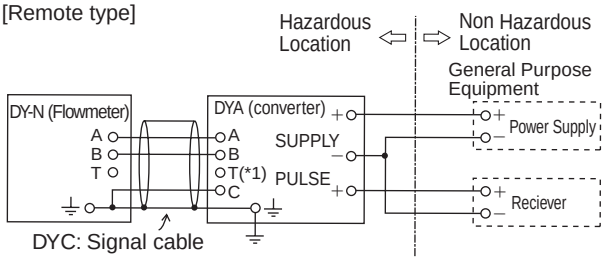
10.1.6 Installation Diagram of Type of Protection "n"

[Integral type]



[Remote type]



(*1): Wire for T termanal
With temperature sensor type: Installed
Without temperature sensor type: Not Installed

Electric data:
Maximum Input Voltage Ui: 30V
Internal Capacitance Ci: 6nF
Internal Inductance Li: 0.15mH

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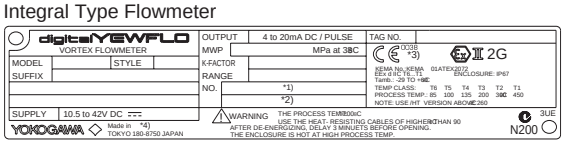
IM 01R06A00-01E-E
3rd edition, Jan. 2007

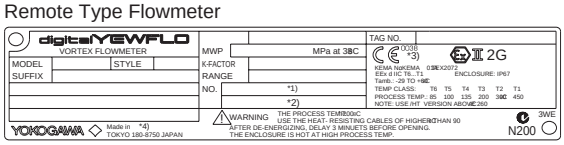
10.1.7 Data Plate

Explosion Proof

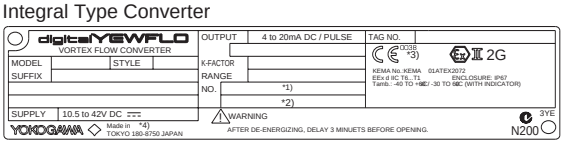
Integral Type Flowmeter



Remote Type Flowmeter

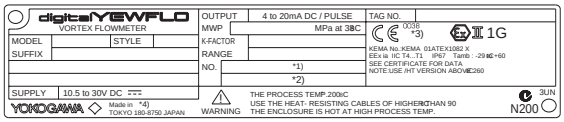


Integral Type Converter

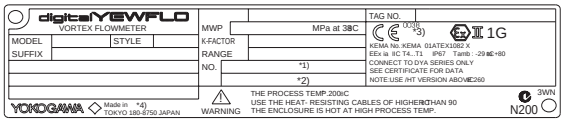


Intrinsically safe

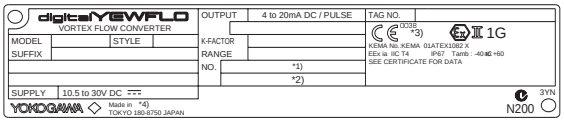
Integral Type Flowmeter



Remote Type Flowmeter



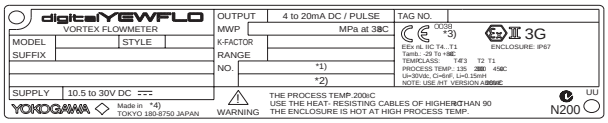
Remote Type Converter



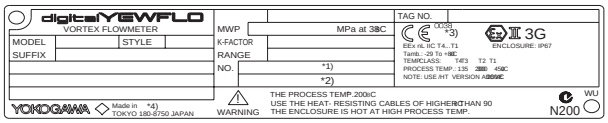
F100102.EPS

Type of Protection "n"

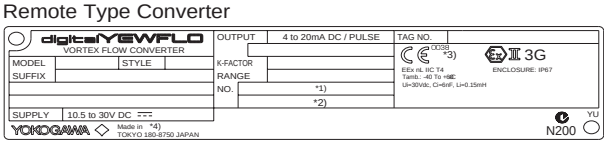
Integral Type Flowmeter



Remote Type Flowmeter



Remote Type Converter



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MODEL : Specified model code
SUFFIX
STYLE : Specified style code.
MWP : Maximum working pressure of apparatus.
K-FACTOR : Sensor constant number of apparatus.
RANGE : Meter range.
No. : Serial number.
TAG. No. : Tag number of apparatus.
YOKOGAWA ◇ Made in *3) TOKYO 180-8750 JAPAN : Name and address of manufacturer.
CE : CE-Marking.
II 2G : GroupII, Category 2 Gas atmosphere.
KEMA No. : Certificate number.
KEMA 01ATEX2072 for EEx d
KEMA 01ATEX1082X for EEx ia
EEx d IIC T6...T1 : Type of protection and temperature class.
Tamb : Ambient temperature.
PROCESS TEMP. : Process temperature.
ENCLOSURE : Enclosure protection No.
NOTE : Note about model, suffix code "/HT"

*1) The third figure from the last shows the last one figure of the year production. For example, the year of production of the product engraved as follows is 2001.

No. 2 1 W C Z Z 0 5 2 1 2 0

Produced in 2001 or

*2) Year of production is indicated in clear text: "Produced 20□□".

*3) The identification number of the notified body. : 0344

*4) The product - producing country.

F100102-2.EF

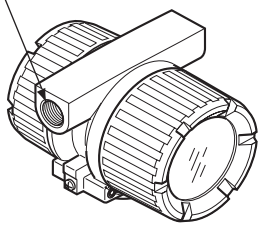
IMPORTANT

- In hazardous location, BT200 BRAIN Terminal can not be connected to the digitalYEWFLO which is approved by CENELEC (KEMA) Intrinsically Safe. (See the IM 1C0A11-01E).

10.1.8 Screw Marking

The type of electrical connection is stamped near the electrical connection port according to the following codes.

SCREW SIZE	MARKING
M20 X 1.5	M
1/2-14NPT	A



F100103.EPS

10.2 FM

10.2.1 Technical Data

• Explosion Proof

Applicable Standard: FM3600, FM3611, FM3615, FM3810, Including Suppliment 1
ANSI/NEMA 250

Type of Protection: Explosionproof for Class I, Division 1, Groups A,B, C and D;
Dust-ignition proof for Class II/III, Division 1, Groups E, F,and G.

"SEAL ALL CONDUITS 18 INCHES." " WHEN INSTALLED IN DIV.2, SEALS NOT REQUIRED"

Enclosure Rating: NEMA TYPE 4X

Temperature Code: T6

Ambient Temperature: -29 to 60°C (Integral Type Flowmeter and Remote Type Flowmeter)
-40 to 60°C (Remote Type Converter)

Ambient Humidity: 0 to 100%RH

Power Supply: 42Vdc max. (Integral Type Flowmeter and Remote Type Converter)

Output Signal (Integral Type Flowmeter):
Current Output; 4 to 20mAdc
Pulse Output; On=2Vdc, 200mA
Off=42Vdc, 4mA

Output Signal (Remote Type Flowmeter):
Output Signal to Converter; 30Vp-p, 100μAp-p

Input/Output Signal (Remote Type Converter):
Current Output; 4 to 20mAdc
Pulse Output; On=2Vdc, 200mA
Off=42Vdc, 4mA
Input Signal from Flowmeter; 30Vp-p, 100μAp-p

Maximum Working Pressure: 15MPa (2160psi)
(DY015 to DY200)
5MPa (720psi)
(DY250 and DY300)

Coating of Enclosure: Epoxy resin coating or Polyurethane resin coating.

• Intrinsically Safe

Applicable Standard: FM3600, FM3610, FM3611, FM3810, Including Suppliment 1
ANSI/NEMA 250

Type of Protection: Intrinsically safe for Class I, II, III, Div.1, Groups A, B, C, D, E, F and G,T4 and Class I, Zone 0, AEx ia IIC T4
Nonincendive for Class I, II, Div. 2, Groups A, B, C, D, F and G, Class III, Div.1, T4, and Class I, Zone 2, Group IIC, T4

Ambient Temperature: –29 to +60°C
(Integral Type Flowmeter)
–29 to +80°C
(Remote Type Flowmeter)
–40 to +80°C
(Remote Type Converter)

Ambient Humidity: 0 to +100% RH (No condensation)

Indoors and Outdoors: NEMA Type 4X

Electrical Parameters:Vmax=30Vdc, Imax=165mAdc, Pi=0.9W, Ci=12nF, Li=0.15mH

Electrical connection : ANSI 1/2 NPT female

10.2.2 Wiring

• Explosion proof

WARNING

- All wiring shall comply with National Electrical Code ANSI/NFPA 70 and Local Electrical Code.
- "SEAL ALL CONDUITS 18 INCHES" " WHEN INSTALLED DIV.2, SEALS NOT REQUIRED".

• Intrinsically Safe

WARNING

- The FM Approved Hand Held Communicator may be connected at any point in the loop between the digitalYEWFLO and the Control Equipment.

10.2.3 Operation

• Explosion proof

WARNING

- Note a warning label worded as follows.
  Warning: OPEN CIRCUIT BEFORE REMOVING COVER.
  INSTALL IN ACCORDANCE WITH THE INSTRUCTION MANUAL (IM) IF6A1-01E.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

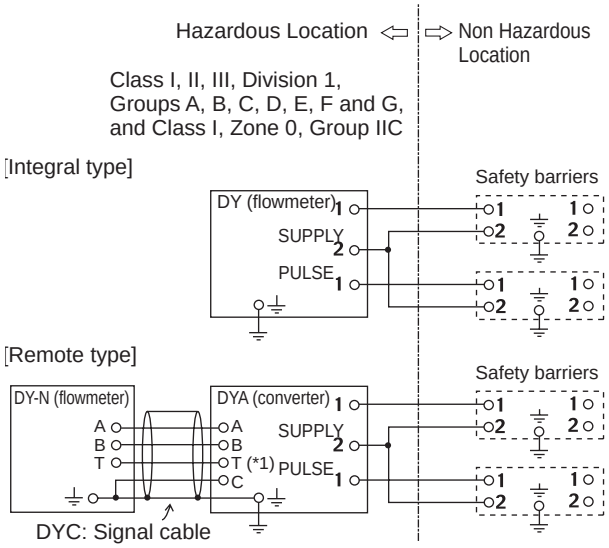
10.2.4 Maintenance and Repair

WARNING

- The instrument modification or part replacements by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the approval of FM Approvals.

10.2.5 Installation Diagram

Intrinsically Safe (and WARNING)



(*1) Wire for T terminal
With temperature sensor type : installed
Without temperature sensor type: not installed

Electrical parameters of vortex flowmeter (DY) and vortex flow converter (DYA).
Vmax=30V Imax=165mA Pi=0.9W
Ci=12nF Li=0.15mH

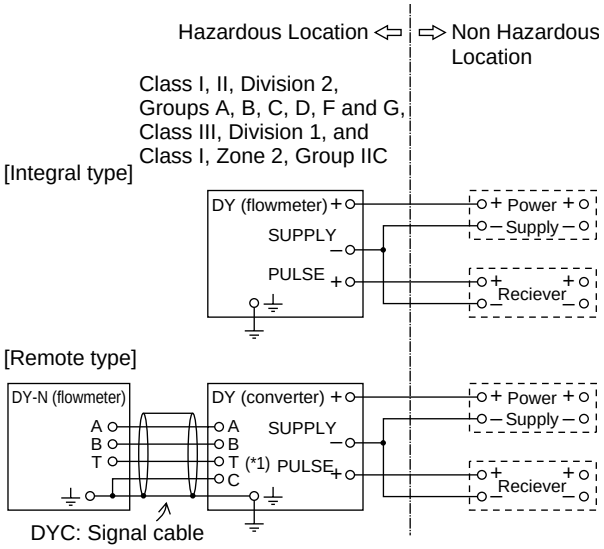
Installation requirement between flowmeter, converter and Safety Barrier
Vt or Voc **%** Vmax It or Isc **%** Imax Po**%** Pi
Ca **^** Ci+Ccable
La **^** Li+Lcable
Vt, Voc, It, Isc, Voc, Ca and La are parameters of barrier.

F100201_1.EPS

WARNING

1. In any safety barrier used output current must be limited by a resistor 'R' such that Isc=Voc/R.
2. Any Single FM Approved Barrier of multiple barriers FM Approved for this configuration who's parameters meet the above installation requirements.
3. Input voltage of the safety barrier must be less than 250Vrms/Vdc.
4. Installation should be in accordance with National Electrical Code, ANSI /NFPA70.
5. Dust-tight conduit seal must be used when installed in class II and III environments.
6. Do not alter drawing without authorization from FM.

Nonincendive (and WARNING)



(*1) Wire for T terminal
With temperature sensor type : installed
Without temperature sensor type: not installed

Non-incendive field wire parameters of vortex flowmeter (DY) and vortex flow converter (DYA).
Vmax=30V Imax=165mA Pi=0.9W
Ci=12nF Li=0.15mH

Installation requirement between flowmeter, converter and general purpose equirement.
Vt or Voc Vmax It or Isc Imax Po Pi
Ca Ci+Ccable La Li+Lcable
Vt, Voc, It, Isc, Po, Ca and La are nonincendive field wire parameters of general purpose equipment.

F100201_2.EPS

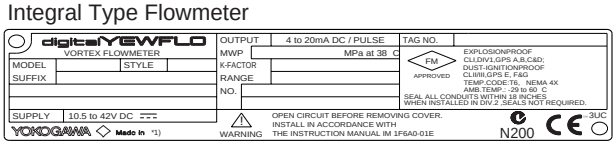
WARNING

1. The general purpose equipment must be FM approved with Nonincendive field wiring parameter which meet the above installation requirements.
2. Installation should be in accordance with National Electric Code, ANSI/NFPA70.
3. Dust-tight conduit seal must be used when installed in class II and III environments.
4. Do not alter drawing without authorization from FM.

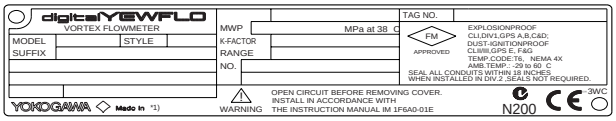
10.2.6 Data Plate

Explosion Proof

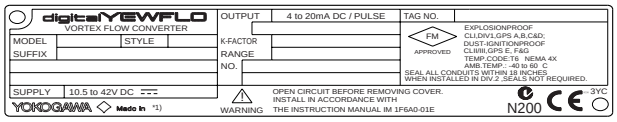
Integral Type Flowmeter



Remote Type Flowmeter

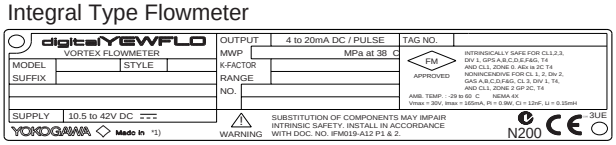


Remote Type Converter

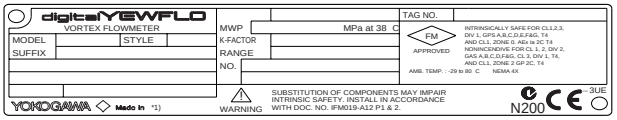


Intrinsically safe

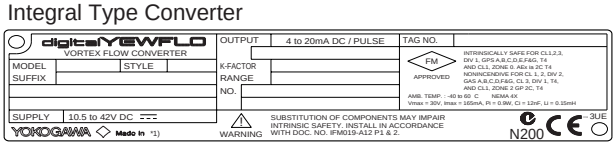
Integral Type Flowmeter



Remote Type Flowmeter



Integral Type Converter



F100202.EPS

YOKOGAWA ◇ Made in *1) TOKYO 180-8750 JAPAN : Name and address of manufacturer.

*1) The product - producing country.

11. PRESSURE EQUIPMENT DIRECTIVE

This chapter is described further requirements and notices concerning the PED (Pressure Equipment Directive). The description in this chapter is prior to other description in this User's Manual.

(1) Technical Data

Type of Equipment: Piping
Type of Fluid: Liquid and Gas
Group of Fluid: 1 and 2

Model	DN(mm)*	PS(MPa)*	PS-DN(MPa-mm)	CATEGORY**
DY015	15	**42**	630	Article 3,*** Paragraph 3
DY025	25	**42**	1050	Article 3,*** Paragraph 3
DY040	40	**42**	1680	II
DY050	50	**42**	2100	II
DY080	80	**42**	3360	II
DY100	100	**42**	4200	II
DY150	150	**42**	6300	II
DY200	200	**42**	8400	III
DY250	250	**42**	10500	III
DY300	300	**42**	12600	III
DY400	400****	**25**	10000	III

T110001.EPS

* PS: Maximum allowable pressure for Flow Tube
DN: Nominal size

** Referred to Table 6 covered by ANNEX II of EC Directive on Pressure Equipment Directive 97/23/EC

*** DY015 and DY025 are not regulated by PED.

**** Special-order product

(2) Installation

WARNING

- Please tighten the bolts for piping-joint according to the prescribed torque values.
- Please take measure to protect the flowmeters from forces caused by vibration through piping.

(3) Operation

WARNING

- The temperature and pressure of fluid should be applied under the normal operating condition.
- The ambient temperature should be applied under the normal operating condition.
- Please pay attention to prevent the excessive pressure like water hammer, etc. When water hammer is to be occurred, please take measures to prevent the pressure from exceeding PS(maximum allowable pressure) by setting the safety valve, etc. at the system and the like.
- When external fire is to be occurred, please take safety measures at the device or system not to influence the flowmeters.
- Please pay attention not to be abrade the metal pipe, when the fluid to abrade the lining such as slurry and sand are contained.

WARNING

The operator is responsible that no corrosion and/or erosion is caused by the medium, which reduces the safety of the unit as pressure vessel. Corrosion and erosion can make the unit fail and can lead to the endangering of persons and facilities. If corrosion and erosion are possible, the integrity of the tubes has to be checked periodically.

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3rd edition, Jan. 2007

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YOKOGAWA HEADQUARTERS
9-32, Nakacho 2-chome,
Musashinoshi
Tokyo 180
Japan
Tel. (81)-422-52-5535
Fax (81)-422-55-1202
E-mail: webinfo@mls.yokogawa.co.jp
www.yokogawa.com

YOKOGAWA CORPORATION OF AMERICA
2 Dart Road
Newnan GA 30265
United States
Tel. (1)-770-253-7000
Fax (1)-770-251-2088
E-mail: info@yca.com
www.yca.com

YOKOGAWA EUROPE B.V.
Databankweg 20
3821 AL AMERSFOORT
The Netherlands
Tel. +31-33-4641 611
Fax +31-33-4641 610
E-mail: info@nl.yokogawa.com
www.yokogawa.com/eu

YOKOGAWA ELECTRIC ASIA Pte. Ltd.
5 Bedok South Road
Singapore 469270
Singapore
Tel. (65)-241-9933
Fax (65)-241-2606
E-mail: webinfo@yas.com.sg
www.yokogawa.com.sg

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Manufactured by:
Yokogawa Electric Corporation
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RotaYokogawa
Rheinstr. 8
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